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11 FEBRUARY 1955

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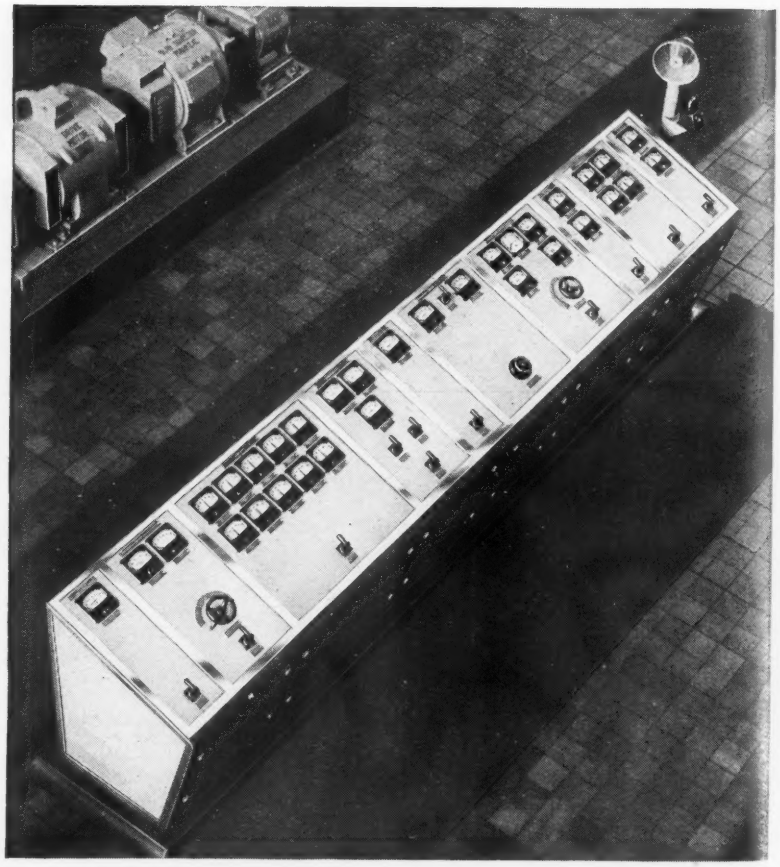

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ELECTRICAL REVIEW

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Electrical Research for Industry

IMMEDIATELY after the war great schemes of industrial expansion and reconversion were put in hand to satisfy the deferred " civilian " demand in the home market and to comply with the Government's appeal for increased exports. Vast sums of money have been and are being spent on materials handling schemes to increase the output of the coal mines or to maintain output as far as possible against reductions resulting from such things as narrowing coal seams and increasing distances between the coal faces and the winder shafts.

Recently we visited Thoresby Colliery, in the East Midlands Division of the National Coal Board, and found an installed capacity of electrical equipment underground of 8,360 h.p. and 11,200 h.p. above ground—figures undreamt of a decade or so back. The steelworks at Port Talbot, at Consett and at Shotton are other examples of comprehensive " integration " schemes which embrace wider ranges of processes from the production of coke and coke-oven gas for consumption in the blast and open-hearth furnaces to the rolling of the final product—in some cases cold rolled tinplate. In new and reconstructed textile works such as those at Doncaster and Catrine we have seen excellent installations embodying not only examples of the most modern development in individual spinning-machine and loom drives and their controls, but also in the pneumatic handling of raw and process cotton under a first class system of electronic control.

Now the way appears to be opening here for large-scale schemes of main-line railway electrification which must involve, apart from traction, extensive development work in track insulating and conducting problems as well as work on high voltage and low voltage distribution.

The success of all such expansion schemes is directly dependent on developments in the electrical industry, mainly because of the unique qualities of the electric drive and, in particular, electrical control. Only long-term electrical research can produce answers to such problems as the construction of motors of thousands of horse power to stand up to the ever-increasing speeds and loadings of the hot rolling mill; the precise speed control of cold rolling mills to secure the improved machinability needed in cold rolled steels; the increasing degree of sequence control called for in connection with coal and other conversion systems; electronic control for such fine materials handling work as raw cotton conveying; and the development of electric railway equipment which will stand up to the rigours of the weather and continuous operation.

It is perhaps not unreasonable to suggest that more might be contributed directly to the cost of electrical research by industries which benefit from that research.

BRIGHTON CONVENTION

Emphasis at this year's British Electrical Power Convention, to be held at Brighton from 27th June to 1st July under the presidency of Sir Harry Railing, will be mainly on industrial aspects, although the Exhibition will, as usual, be fully representative of the domestic side. As was shown in the preliminary programme which we published last week, the theme of the Convention is " Electricity and the Future " and it is therefore fitting that education and training should form the subject of one of the sessions. The pace of progress must be profoundly influenced by the quality of the young men to whom the future of the industry will be entrusted. There are to be papers touching upon education and training in the electricity supply, manufacturing and installation branches. Another group of papers will deal with the future of electricity in the steel, coal, chemical and catering industries. While each industry has its own peculiar problems and applications, the papers and the subsequent discussion should disclose much of common interest and help towards the expansion of the industrial use of electricity generally. The views of the electricity supply industry on generation in the next decade will preface the two groups of papers. They will be presented by Mr. J. Eccles, President of the Institution of Electrical Engineers, who is described as " deputy chairman (operation), *Central* Electricity Authority," as the B.E.A. will be called after 1st April.

STEAM FROM ATOMIC ENERGY

Following the changes in the Atomic Power Act in the U.S.A. the Consolidated Edison Company of New York has decided to invite tenders for a complete 200 MW atomic energy turbo-generator plant. While no specification is to be laid down for the plant, the supply company does make one suggestion to the manufacturers, namely, that they should investigate the use of a separately (fuel) fired superheater with a view to obtaining higher steam conditions than those which are afforded by the heat transferred from the nuclear reactor in its present generally known state of development. This suggestion seems to underline the contention expressed in the leading article in the *Electrical Review* of 14th January that " by comparison with the heat transfer in a normal coal-fired power station, the thermal efficiency of nuclear energy production of electricity is very low." The steam conditions appear to compare with those in force in this country forty or more years ago, while the boiler or steam generator employed is rather like a present-day waste-heat boiler. Another important point bearing on this matter is the probable higher capital cost of a turbine designed for operation on the lower steam conditions.

RAIL AND ROAD

It seems to be the opinion in some circles that the proposed expenditure of £1,200 million upon the modernization of the railways may reduce the amount of capital available for improvement of the roads. This idea should have been dispelled by the Minister of Transport's announcement last week of the Government's plans for road development. Both rail and road schemes have been criticized on the score of inadequacy, but even an inadequate improvement in the railways will relieve the roads by attracting more goods and passengers. The Opposition in last week's debate on railway wages returned to the charge that by detaching the road services from the British Tranport Commission the Government had prevented the railways from recouping their losses from road traffic. This " swings and roundabouts " argument is unsound. It is better that by electrification and other improvements the railways should be made to pay than that obsolescence and inefficiency should be paid for by other forms of traffic.

E.I.B.A. JUBILEE

In this issue there is a notification of a luncheon to be held on 19th April to celebrate the golden jubilee of the Electrical Industries Benevolent Association. It was in 1905 that the National Electrical Manufacturers' Association (the forerunner of the B.E.A.M.A.) discussed the provision of a fund to give relief (including pensions) to deserving and necessitous persons who were or had been engaged in the electrical trade, or their dependants. Later in the year rules for this Electrical Trades Benevolent Institution were adopted and fifteen committee members were appointed, with power to add to their number; they included such well-known men as H. Bevis, H. H. Berry, Justus Eck, T. J. Granger, P. A. Lundberg and F. H. Nalder. The fund started with only £260 but there were firm promises of donations from a number of firms and individuals and it was reported that to the amount would be added " a good sum " from the surplus of the Electrical Exhibition at Olympia. The Institution became the E.I.B.A. in 1933. Mr. Justus Eck, writing in 1936, looked forward to this jubilee when, he said, the invested funds of the Association would be not less than a thousandth of the capital invested in the industry. Perhaps that was too much to hope for but the funds should surely amount to more than £100,000 for this great industry.

CLEAN AIR

Having already announced the Government's acceptance of the main recommendations of the Beaver Committee on Air Pollution, the Minister of Housing and Local Government went further last Friday when he promised that a Bill to give effect to the recommendations would be introduced this session. Mr. Sandys was announcing the Government's inability to accept the Clean Air Bill introduced by Mr. G. Nabarro which, he said, had necessarily been drafted without full consultation with local authorities, industry and other interested parties and could not contain the financial provisions necessary to make it fully effective. His object of forcing the Government to take action having been achieved, Mr. Nabarro withdrew his Bill. The proposed Government measure will have a considerable impact upon the electricity supply industry, favourable and possibly unfavourable. While it should mean a considerable expansion in the use of electricity the Bill may add considerably to the cost of producing it.

High Permeability Steel Castings

Design and Manufacturing Techniques

By J. F. HINSLEY, F.I.M.*

IN Chambers's Technical Dictionary " steel " is defined as " essentially an alloy of iron and carbon; contains less than 2 per cent carbon, less than 1 per cent manganese, and small amounts of silicon, phosphorus, sulphur and oxygen." (This definition excludes " alloy steels," a class of great importance and diversity of composition.)

Iron and carbon are thus the essential constituents of steel. The other elements, sulphur, phosphorus, silicon and manganese are always present in commercial steels. The first two are usually kept to as low a percentage as the refining process used by the steelmaker will permit. Silicon and manganese have important and useful effects both in the steelmaking process and in the subsequent use of the steel and may, therefore, be controlled so that their percentages fall in definite ranges.

Other things being equal, the ability of steel to bear loads, either in compression or in extension, is increased as the carbon content is increased. On the other hand, such an increase in mechanical strength is accompanied by a decrease in magnetic permeability. For any particular application, therefore, the need for each of these opposing qualities must be studied and, if necessary, a compromise reached.

Low carbon steels have a high melting point and, further, electrical castings are usually of a complicated nature with large areas of thin section, so that temperatures well over the melting point must be reached in the steelmaking process which precedes pouring the castings. This requirement was met, and the path to production in quantity of steel castings for the electrical industry was opened when the late Charles Kingston Everitt caused the pioneer Tropenas side-blown converter plant to be installed at the Imperial Steel Works in 1892. In the earlier Bessemer converter process, air is blown through molten cast iron contained in a vessel (the " converter "), the air-holes or *tuyeres* being situated in the bottom of the vessel. The oxygen in the air combines with the carbon in the metal so that in due course the proportion of carbon becomes very small (the reduction being in the order of from 3 per cent to 0·1 per cent) and the temperature rises considerably. Unfortunately the intimate contact of air and metal may lead to nitrogen pick-up which may be undesirable for some applications.

In the Tropenas converter the air is blown in at the side of the vessel, over the top of the metal on the surface of which a protective layer of suitable slag is floated. The action therefore is:—air oxidizes slag; slag oxidizes carbon in the metal. In this way nitrogen pick-up is minimized and hot liquid steel suitable for running complicated electrical castings is produced. In considering the pioneering of applied electricity it is worthy of note that C. K. Everitt was later to see the first works automatic telephone exchange and the first Héroult electric arc furnace in this country and subsequently the first high-frequency electric furnace for steelmaking in the world installed in the same works.

Reasons for Use of Steel Castings

The manufacture of steel castings requires expensive plant and highly skilled personnel. It is worth while, therefore, to examine some of the reasons for the use of steel castings in electrical plant and apparatus. These reasons may be listed as:—(*a*) magnetic properties; (*b*) mechanical strength; (*c*) ability to form complicated shapes.

The first two reasons are taken into account in B.S.1617 —" Steel Castings of High Magnetic Permeability," in which two grades " A " and " B " are specified. Grade " A " is intended to cover steel castings in which high permeability is the first consideration. Examples are yokes for electromagnets (Fig. 1), electromagnetic chuck castings (Fig. 2) and the shells or yokes of motors and

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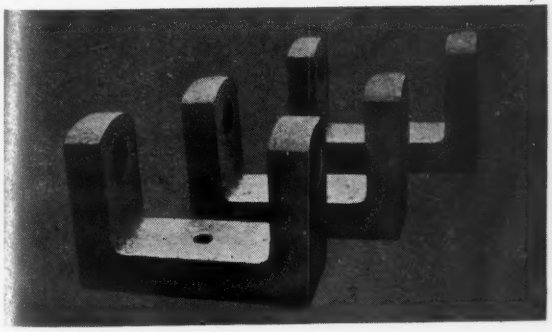
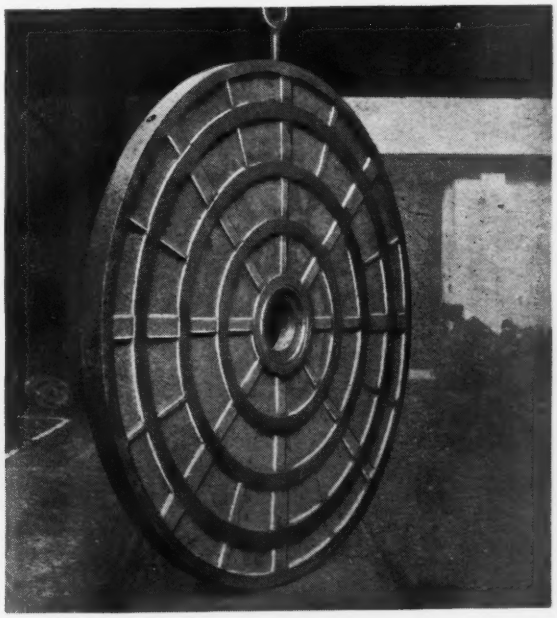


Fig. 1.—Yokes for electromagnets

Fig. 2.—Three ton magnetic clutch casting



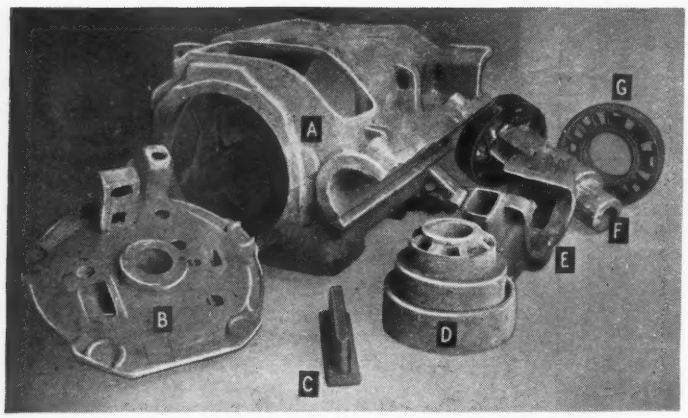


Fig. 3.—Traction motor castings. A yoke, B end housing, C interpole core, D commutator hub, E axle bearing caps, F armature spider, G armature end plate

generators. Grade " B " caters for requirements in which the designer is prepared to concede a little in respect of permeability in order to ensure higher mechanical strength. Examples are yokes and other parts for traction motors (Fig. 3) and spiders for larger machines (Figs. 4 and 5).

Figs. 6 (*a*) and 6 (*b*) show graphically the production range of magnetic properties obtained over a period in steel castings produced to comply with the two grades of B.S. 1617. The average mechanical properties are shown in the accompanying table.

	Ultimate tensile strength (tons/sq in)	Yield (tons/ sq in)	Elongation (per cent on 2in)	Reduction in area per cent	Bend
Material produced to B.S. 1617 Grade " A " Annealed 920 deg to 940 deg C...	24·4	15·4	41·0	68·0	180 deg sound
Material produced to B.S. 1617 Grade " B " Annealed 920 deg C	28·8	20·0	37·0	60·0	180 deg sound

In the past there have been almost as many specifications for electrical steel castings as there were electrical manufacturers. Methods of testing for magnetic properties were equally varied, and a wide scatter in results was likely if a given test-piece was circulated for test in the different laboratories. A good number of electrical manufacturers now work to B.S. 1617, however, and a new British Standard covering the actual testing has now been published as B.S. 2454 : 1954.

The third requirement, that of ability to form complicated shapes, is amply illustrated by Figs. 3 and 4, and in considering this aspect, it is gratifying to record that the designers of electrical machinery have shown willingness on an increasing scale to co-operate with steel founders when producing a new type of machine, and that this joint effort has led to improved strength, appearance and performance. Much progress has been made in designing to ensure uniformity of section thickness with consequent advantages in respect of avoiding " hot-spots " in the casting process.

" Hot-spots " can be caused by local increases of ruling section, e.g. at the junction of four strengthening ribs, and also by the well-intentioned but misguided idea that if a certain part of a casting is highly stressed, then it must be made three or four times as thick as the rest of the casting. The cycle engineers and later aircraft designers found that a tube was a far more effective structural member than a solid bar. This experience has been drawn on for example by the traction motor designer who now makes the suspension noses of a box-form member instead of the previously-used solid block.

Principles Affecting Casting Design

The principles influencing the success of a casting design may be illustrated by considering what might appear to be a geometrically simple casting, such as making a 3in cube to be cast in lead. The layman may gain the impression that this is a straightforward matter of making a cubical mould and pouring in molten lead. His first surprise would be a large pit or shrinkage cavity in the centre of the casting. He might have other surprises such as gasholes or blowholes caused by dampness of the mould. By repeated trials he might improve his technique and learn that shrinkage cavities could be

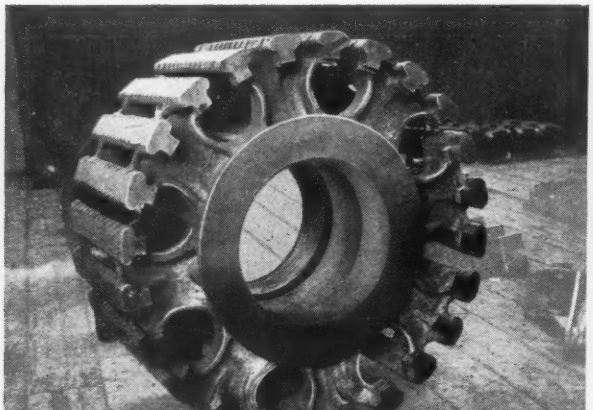


Fig. 4.—Three ton armature spider casting

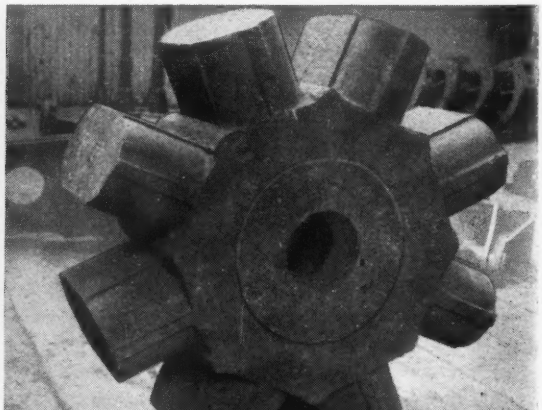


Fig. 5.—Heavy armature spider casting (about 5 tons)

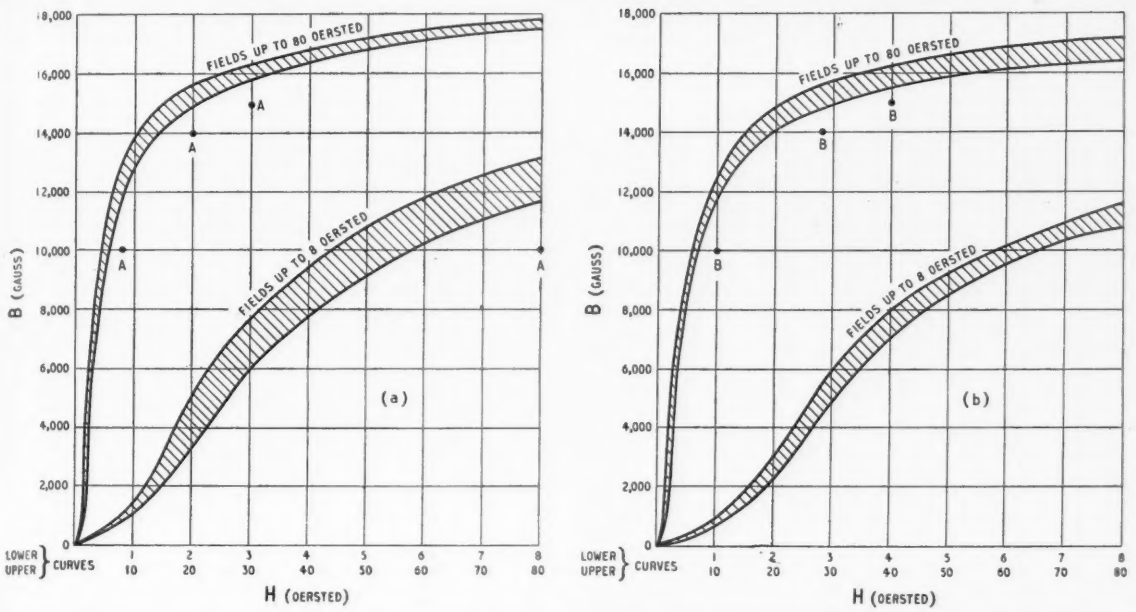


Fig. 6 (a) and (b).—Production range of magnetic properties in steel castings produced to B.S. 1617 Grades A and B. Points A and B refer to the respective standard requirements

avoided if he fed the casting by "feeding heads" or "risers" and that other troubles could be minimized by a systematic approach.

Foundry Technique Development

High permeability steels or irons have the highest melting point of any of the commercial or "tonnage" metals, and temperatures of well over 1,600 deg C are necessary in order that intricate moulds may be properly cast. It can be appreciated therefore how much greater are the problems involved than those sketched in respect of the lead cube.

The foundryman has new aids with which to attack such problems, and some of the most powerful of these allies are found in the methods of "non-destructive testing." At one time, the freedom of a casting from internal defects or cavities was assessed by cutting it into two or more pieces. This method, however, only gives information about the path pursued by the bandsaw and, in common with other destructive methods of test, ruins the part tested. To-day, the foundryman gains far more information about his product by means of radiography or other non-destructive tests and has the advantage that the proved sound casting is not harmed in any way.

Procedure may be illustrated by considering the traction motor yoke shown in Fig. 3. A foundry may be called on to supply a large number of such castings. Under the old system, a cut-up test might be performed on the first casting and considered to prove satisfactory. Production now goes ahead and in due course a quantity arrives in the machine shop. It may happen that removal of metal, by drilling or otherwise, reveals that all the batch possess localized cavities which could have been eliminated had the foundryman known of this tendency in the first or pilot casting. Such a discovery at a *late* stage of the manufacturing procedure disorganizes production.

The availability of radiography, however, leads to a different approach. The pilot casting is radiographed in stressed parts, thick bosses, pads or other regions where the foundryman anticipates difficulty. If shown to be necessary, amendments are made in the foundry technique and a second casting is examined in the same way. The foundry technique for this casting is thus established or sealed and subsequent examinations can be made on a reduced basis, say one in every ten castings. In this manner the established technique can be satisfactorily maintained without excessive radiography.

Some Design Considerations

The designer of electrical machinery usually finds that for applications where space and weight are limited, as for instance in the design of traction motors, magnetic flux density in a particular cross section causes more concern than the mechanical strength of the section. It is, therefore, interesting to note that the judicious use of fillets or generous radii at points where one section blends into another not only assists in keeping down the flux density at such awkward locations, but also reduces the tendency to produce "hot tears" in the process of cooling after casting.

A further design point is that the induction or flux density in a magnetic circuit is equal to the sum of the field producing the flux and the actual magnetic intensity in the material of the circuit. This is usually expressed as the equation $B = H + 4\pi J$, and brings home the lesson that in a circuit including an air-gap the exciting

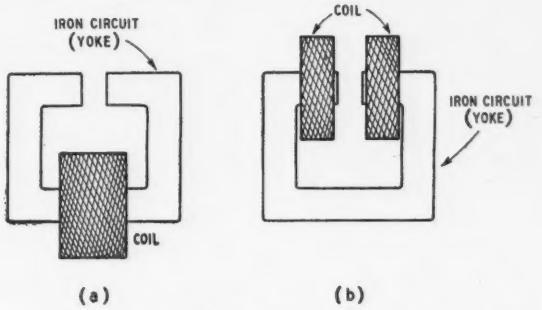


Fig. 7.—Comparison of two designs to show that the exciting coils should be as near the air gap as possible

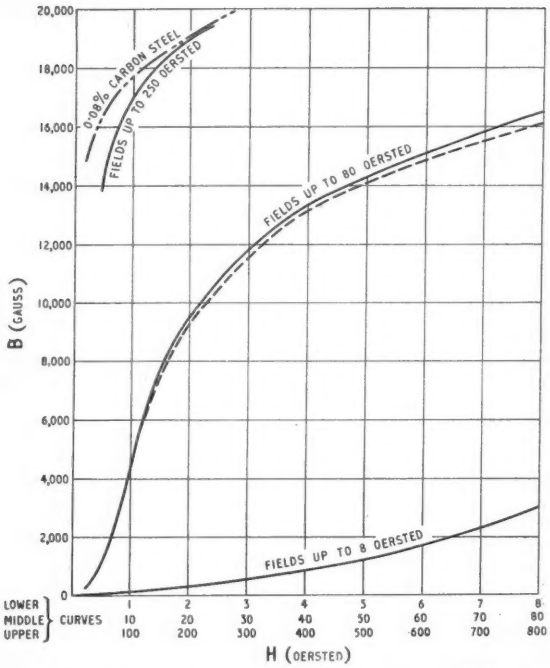


Fig. 8.—"Fortiweld" normal magnetization curves taken on cast material after normalizing; broken line on middle curve indicates lower limit of the range over a number of casts

coils should be as near to the air-gap as possible. Thus in Fig. 7 (*b*) is a much more efficient design than (*a*) since at very high fields, when the permeability of ferromagnetic materials approaches unity, the contribution of the coils in (*b*) to the useful flux in the gap may be nearly as great as that due to the induced magnetism in the yoke.

"Non-Magnetic" Steels

It sometimes happens that designers require a metal with the mechanical properties of steel, but of a non-magnetic character. Examples are "bumper plates" of lifting magnets and structural parts of ships which are to be used for magnetic survey purposes. The term "non-magnetic" may probably be only truly applied to a perfect vacuum, since all materials seem to exhibit some magnetic properties when highly sensitive apparatus is employed to make a test. It is more correct therefore to refer to materials of "low magnetic permeability" and one of the best-known of these is the 13 per cent manganese, 1 per cent carbon steel, often referred to as "manganese steel." This steel can be cast, rolled or forged and has a permeability of approx. 1·002 when correctly heat-treated. It is an ideal material for the bumper plates of lifting magnets, since its great toughness enables it to withstand the severe blows which occur when the magnet is employed to lift billets or heavy scrap. Busbar clamps and switchgear covers are frequently specified to be made as manganese steel castings. Other low permeability materials are 18/8 type stainless steels and some alloy cast irons.

It sometimes occurs that a designer requires a magnetic material with rather higher mechanical strength than usually envisaged. Of interest in this connection is the recently developed "Fortiweld"* steel. This material contains a very small amount of boron and about 0·5 per cent of molybdenum. It can be cast, rolled or forged and with a simple normalizing treatment can give an ultimate tensile strength of over 40 tons/sq in. The normal induction curve of the cast and heat-treated material is shown in Fig. 8. Part of the curve for a 0·08 per cent plain carbon steel has been added for comparison and it will be observed that at high magnetizations the two curves approach closely.

Where the very highest permeability is required the carbon content of steel may have to be kept as low as 0·025 per cent. The achievement of such a low figure by ordinary methods of steelmaking is an almost impossible task. In recent years, however, the removal of carbon from steel by oxygen treatment has been put on a safe and systematic basis, largely by the work of W. H. Everard and his associates at the Imperial Steel Works, so that steels or irons are now available with carbon contents much lower than had at one time been thought commercially possible. Fig. 9 gives some idea of the vigour of the reaction which occurs when oxygen under high pressure is introduced into an electric arc furnace.

The author would like to acknowledge with many thanks the permission granted by the directors of Edgar Allen & Co., Ltd., to use and publish material gathered in the course of his duties.

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Fig. 9.—The introduction of oxygen into an electric arc furnace

WORLD ELECTRICAL MARKETS

The Republic of Ireland

By a Dublin Correspondent

ALL towns and villages, with very few exceptions, in the Republic of Ireland are now supplied with electricity from the national grid. A rural electrification scheme which aims at supplying 280,000 rural dwellers has been in progress for the past six years and will be completed in another five or six years.

At present the Electricity Supply Board has 450,000 consumers and of these 120,000 are in the rural electrification areas. They are at present using electricity at the annual rate of 1,100 million kWh, and this consumption is analysed in Table I.

To meet this demand the Board has ten generating stations with a total capacity of 382,500 kW, while under construction or planned for completion within the next six years are thirteen more stations with a total generating capacity of 386,000 kW. The existing stations use water, peat, imported coal and oil for generation; the new plants will include one to use a native anthracite coal as well as the four power sources mentioned.

One of the new stations, of 60 MW capacity, situated in Cork and using coal or oil, was to begin operation before the end of last year and another similar plant of 90 MW in Dublin will be in full operation in 1956. The remainder, comprising eight peat-fired stations, two hydro plants and a native-coal-fired plant will be commissioned between 1957 and 1960.

Consequent on this station programme, of course, extensions have been made to the high voltage grids; existing transformer stations have been extended and new ones erected, while more are being planned. A new Load Despatch Office linked to the existing generating and transformer stations has been constructed and is operating in a new building at the Board's headquarters in Dublin. In due course this will also be linked to the new stations.

The growth of the use of electricity in the Republic of Ireland in the post-war years is seen in Table II.

The amount of electrical equipment or machinery manufactured or assembled in the Republic is very small. All power station and transformer station plant is supplied from outside under competitive tender. Since the war turbo-alternators, boilers, transformers, switchgear, etc., have been and are being delivered by well-known firms in Great Britain, Sweden, Switzerland, Germany, Italy and Belgium. The import figures for the past few years, indicating the value of equipment imported from Great Britain, are given in Table III.

Table I.—Analysis of Annual Consumption

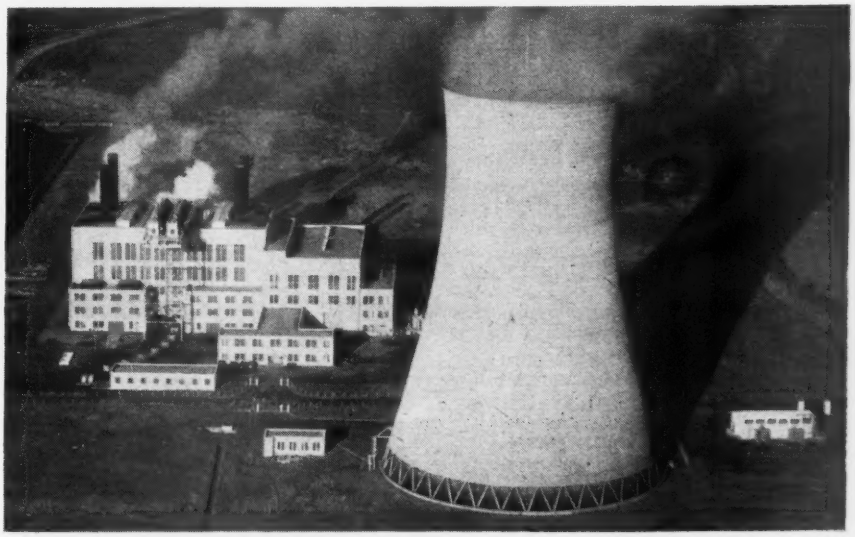
Class of load	Annual consumption million kWh
Domestic	448
General lighting	70
Cooking and water heating	116
Night storage heating	66
Motive power	365
Public lighting	25
Miscellaneous	10

Table II.—Expansion of Electricity Consumption

Year ended 31st March	kWh sold (thousands)	Revenue £000	Total No. of consumers
1947	453,655	3,589	248,030
1948	492,149	3,863	262,598
1949	569,257	4,344	284,198
1950	626,174	4,774	310,639
1951	770,377	5,584	343,376
1952	835,326	6,531	372,743
1953	929,641	7,628	402,395
1954	1,051,746	8,517	435,985

The manufacture and assembly of electrical material is confined at present to rubber and p.v.c. insulated cable for house wiring; steel-cored aluminium conductor and copper conductor; single-phase and three-phase transformers up to 1,000 kVA; electric meters assembled by branches of British and German firms; assembly of three-phase motors up to 10 h.p. and single-phase motors up to 2 h.p.; and the manufacture of Bakelite plugs and sockets.

In the domestic appliance sphere more progress has been made in manufacture and assembly and at present there is one firm turning out one-, two- and three-plate cookers, irons, fires, toasters, boiling rings, breakfast cookers, convector heaters, night load heaters, cupboard



The Electricity Supply Board's peat-fired power station at Allenwood, Co. Kildare

Aerial view of the Pollaphuca (River Liffey) hydro-electric station

airers, table lamps, tubular heaters, storage water heaters, immersion groups and grain dryers. Another firm makes irons, kettles and fires, while others are engaged in the assembly of vacuum cleaners, refrigerators, cookers, washing machines and dryers.

In addition to the home manufacture and assembly of domestic appliances the imports for the past two years are seen in Table IV.

There are *ad valorem* duties on certain domestic appliances imported from Great Britain as follows:—Cookers, up to four-plate, 25 per cent (except those imported under licence issued by the Department of Industry and Commerce which are at present not subject to duty); water heaters, 1½ to 28 gal, 50 per cent; immersion groups, 40 per cent; irons (up to 8 lb), 40 per cent; fires, 40 per cent; and toasters, 40 per cent. The duties on such appliances imported from other countries are higher. Refrigerators, washing machines, vacuum cleaners, floor polishers, etc., are not liable to duty.

The imports come from leading British manufacturers of domestic electrical equipment, principally from those with local representatives in Dublin who are in a position to study the market and make personal contact with distributors and retailers.

Sales of domestic equipment have risen this year due chiefly to a selling campaign backed by extensive newspaper, radio and mail advertising and publicity begun about a year ago by the Electricity Supply Board. Manufacturers and distributors have also engaged in more than usual advertising and publicity, and the combined effort appears to be producing good results.

Table III.—Irish Electrical Imports

Class	1952		1953	
	From Great Britain	Total	From Great Britain	Total
	£	£	£	£
Generators & alternators	191,240	777,132	57,082	229,328
Motors	185,405	231,503	181,979	233,569
Transformers	320,690	742,259	184,286	906,892
Switchgear	277,634	475,699	183,443	607,227
Lamps & tubes complete:				
Fluorescent	29,673	31,348	21,681	24,728
Filament lamps ...	41,903	47,532	49,943	56,766
Other lamps	13,395	20,377	9,111	16,672

Table IV.—Imports of Domestic Equipment

Appliances	1952		1953	
	From Great Britain	Total	From Great Britain	Total
	£	£	£	£
Cookers...	216,356	218,118	88,571	91,834
Vacuum cleaners ...	156,089	183,403	69,373	98,541
Washing machines ...	169,738	185,821	181,012	183,864
Drying and pressing machines	81,645	100,284	66,160	76,224
Refrigerators	375,920	460,352	265,132	293,176

The future prospects for domestic sales are good. As has been shown, the Electricity Supply Board has planned to double its generating plant in the next five or six years, as the trend of demand since the end of the war indicates a doubling of consumption in that period.

Three factors support the Board's confidence in that direction. One is the extensive house building programme in urban and rural areas; second, is the fact that approximately 160,000 new rural consumers (apart from urban ones) are due to be supplied within the next six years; and third, outside Dublin, Cork and a few other urban centres there is no competition from gas. Generous long-term hire-purchase terms are available for the more expensive equipment such as cookers, refrigerators, washing machines, vacuum cleaners, etc.

In its report for the year ended 31st March, 1954, the Electricity Supply Board gave an indication of the value of the market for appliances in the rural areas. It stated that an investigation of the utilization of electricity was carried out in a number of representative areas. It was found that the following percentages of consumers in some of the better developed areas were using the following appliances:—Mains radio sets (79); irons (64); kettles (44); cookers (25); fires (22); washing machines (17); water boilers (17); water pumps (11); root pulper motors (9); infra-red lamps (9); milking machines (6); and grain grinders (6).

The survey also disclosed that approximately 78 per cent of the consumers had power sockets installed in their houses but in only a small number of cases were power sockets installed in the out-offices; 26 per cent had an average of four lights in their out-offices. The average number of lights in the domestic portion of the premises was six.

There is a market for well-made and well-finished domestic appliances and it would be advisable for any manufacturer wishing to enter this market to consult the Sales Department of the Electricity Supply Board. The Board is the largest individual purchaser and seller of

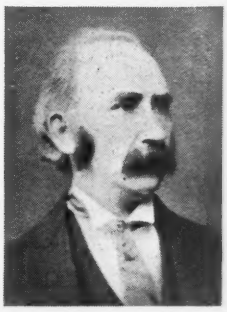
appliances and has now begun an intensive selling campaign. Its selling organization covers the entire State; it has a detailed knowledge of the market and its requirements and should be in a position to give detailed information on all aspects.

Personal representation is desirable, preferably in Dublin. The representative needs to be equipped with well-produced, but not necessarily expensive and elaborate, catalogues for distributors and retailers, as well as with advertising leaflets, booklets and display cards advocating the merits, value and economy of his product.

He should be able to guarantee delivery dates. The failure of factories to keep the promises of salesmen is not uncommon and causes much irritation. In general, he should be a convincing salesman with confidence in his product and his company.

Electrical Company's Centenary

Bell and Indicator Makers



The late Mr. Julius Sax

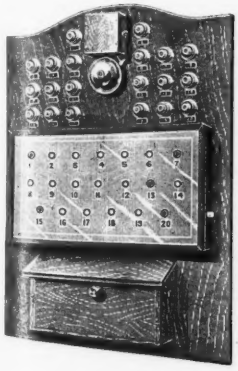
THIS year Julius Sax & Co., Ltd., Brentford, celebrate the centenary of their business. Founded by the late Mr. Julius Sax in 1855, in Bloomsbury, the concern moved to more extensive premises in 1927 at West Lodge, Lower Hill, Hammersmith, reported to have once been the home of Nell Gwynne. During the last war the building was demolished by a flying bomb and temporary premises were taken at Chiswick. With the expansion of the business it was decided to erect a new factory, and the present premises in Commerce Road, Brentford, were occupied in 1949.

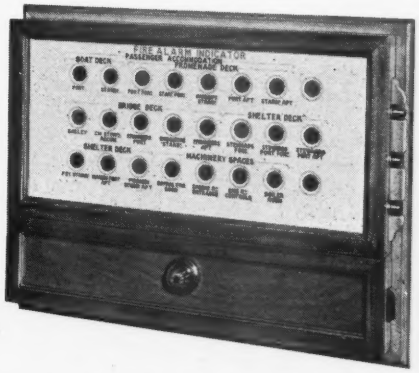
Julius Sax, who died in 1890, first came into prominence when he was employed by Professor Graham, Master of the Royal Mint, to construct automatic and other balances for use in the Mint. For this he subsequently obtained a prize medal at the Great International Exhibition of 1863. These balances were purchased by the Hong Kong Mint.

Mr. Sax then turned his attention to the invention of various telegraphic, telephonic and scientific electrical instruments. A telephone installed for Queen Victoria in Osborne Cottage was one of the first to be used by Royalty. In 1855 he commenced manufacturing electric bells, indicators, fire alarms, etc. His original designs have served largely as prototypes of this equipment in use all over the world. Sax's rubbing contact bells and electrical replacement indicators are still being manufactured by the company, their basic design having been hardly altered, although up-to-date material and methods of workmanship are now used in their manufacture.

Among Mr. Sax's various inventions were an electro-magnetic telephone, a workman's tell-tale clock, electric call bells and fire alarms, adopted by the Metropolitan Fire Brigade and Metropolitan Police, an electric weathervane, a billiard marker, an electric carriage indicator and various other devices.

In carrying on the high tradition of its founder, the company now manufactures an extensive range of electric bells of all types, indicators, pendulum, mechanical and electrical replacement, as well as transformers, fire alarms, bell pushes, trickle chargers, and associated equipment. Other products are luminous call and flashing light indicators and relays for equipping hospitals, public buildings, factories, etc., and a wide range of flush and hinged lid wall sockets and plugs.





Field service indicator set with patent electrical replacement movements as supplied to the Yeomanry Field Hospitals for service in South Africa 1899–1902 and (right) present day institution type fire alarm indicator. Note similarity of basic design

Resistance Welding

THE history and development of resistance welding was the subject of the presidential address given by Dr. H. G. Taylor before the Society of Engineers on 7th February. The chief credit for the invention and application of this process should go to Professor Elihu Thomson who filed his first patents in 1887. He formed a number of companies in the United States and took out a very large number of patents on butt, seam, spot and flash welding. For many years the most important process was slow butt welding, but this was to-day almost entirely replaced by flash-butt welding. Spot welding had developed from a hand or foot operated single spot machine to complicated mechanically operated machines which made hundreds of spot welds at the same time.

The accidental discovery of resistance welding by Thomson was paralleled in the discovery of projection welding which it was at one time thought would displace spot welding. The latter had its main application in thin sheet but experimentally a total thickness of plate of over two inches had been welded both here and in America.

Engineering in Europe

Abstracts from Foreign Technical Journals

A CONCISE and simplified version of Vidmar's method of determining the flux distribution in a three-phase transformer during sustained short-circuits between two outers or between one outer and the neutral, and of calculating the short-circuit currents is presented. Active resistances and magnetizing currents are neglected and the permeability assumed as infinitely large. Windings in Y-Y connection with thin cylindrical coils are considered.

In a two-phase short-circuit the two short-circuited secondary coils are each stressed by 50 per cent of the no-load voltage; the short-circuit currents at the primary and secondary sides are greater by factors $\sqrt{3}/2$ than in the case of a three-phase short-circuit. The single-phase secondary short-circuit current is smaller in the ratio $1/(1+a/3)$ than the three-phase short-circuit current; the corresponding primary current becomes $2/3$, the primary currents of the unaffected phases $1/3$ of this value; a is the ratio of the permeance of the total leakage flux of the yoke to the sum of the permeances of the three coil leakage spaces. This ratio depends on the design of the transformer. Also, the magnetic stressing of the two unaffected core limbs increases to a value between the no-load stress and $\sqrt{3}$ times no-load stress.—" Sustained Two-Phase and Single-Phase Short-Circuits of a Transformer," E. Kübler, *E.T.Z.(A)*, Vol. 75, No. 24, pp. 809-811, 11th December, 1954, in German.

Transmission Line Protection

The compensated multi-phase relays of Bresler's type introduced in 1945 as Mark ISB-182 relays had the advantages of providing directional distance protection against any inter-phase short-circuit, being faster and more sensitive than other types and failing rarely even in short lines where the ratio of line to transient fault impedance was most unfavourable. Since the relays do not respond to symmetrical processes, they remain unaffected by oscillations and overloads not leading to short-circuits.

Operational experience has shown that improvements of these relays were still possible and desirable, particularly in the sense of the modern tendency of basing the integration of all the effective influences on electric rather than magnetic integration methods, this improving the utilization of the magnetic circuit, extending the regulating range of the relay and reducing the influence of the transient processes in the instrument transformers on relay operation. Also, the lock-out devices against oscillations set up by negative-sequence voltages and currents required some improvements. Comprehensive development work carried out by the " Teploelectroprojekt " resulted in the design of a quadripole-type induction relay with a cylindrical rotor to the windings of which voltages proportional to $U-IZ$, and $U+IZ_2$ are applied. For $Z_1=Z_2$ and 90 deg phase difference between the current components in the windings the characteristic of the relay in the complex (R, X) plane is a circle with centre at the origin of the co-ordinates.

When the Z_1/Z_2 ratio changes, the characteristic is displaced along the X-axis, for a change in phase, along the R-axis. The distinctive characteristic of this type is that the parameters of the circuits of the windings are so chosen as to produce resonance at a frequency near 50 c/s, viz. current resonance in one of the winding circuits and voltage resonance in the other. This, together with the 90 deg phase difference, ensures a sinusoidal character of 50 c/s for the transient processes and prevents distortion of the phase of the currents in the windings and of the sign of the torque. The latter rises and falls smoothly to a new steady state. A number of examples of protection circuits using the new relays, for systems with large and small short-circuit currents, are described and their performances discussed.—" New Distance Protection for Transmission Lines," Yu. A. Gaevenko, *Elektrichestvo*, No. 11, pp. 16-22, 1954, in Russian.

Overhead Line Surge Resistance

Long experience and an impressive amount of research work on the lightning risks on overhead lines have yielded the gratifying result that not only the problem of ensuring almost complete safety against lightning dangers on any line has become more or less a question of financial investment, but also that the lightning safety of an individual line may be assessed without the need for resorting to laborious " exact " calculations. As in so many other fields, statistical methods have proved to be more helpful and expedient than rigorous theoretical methods where results are required quickly and should represent a well-defined probability.

It is possible to estimate with a satisfactory accuracy in this way the probable number of direct strokes to a line, protected by earth wires or unprotected, the probability of back flashovers and that of outages due to such events, and all this either by simple formulæ or, even more conveniently, by graphical methods. The methods are based on a few details of the line design and on always obtainable meteorological data for the region through which the line passes. The article shows the practical working of one of these methods and illustrates it by several fully worked examples.—" The Resistance of Overhead Lines to Atmospheric Surges," J. Jirku, *Elektrotech. Obzor*, Vol. 43, No. 10, pp. 526-534, 1954, in Czech.

Contact Rectifiers

The first contact rectifier plants were connected as bridge circuits with three commutating reactors which, although economic in construction, were not fully satisfactory where controllability and overload capacity were concerned. Since the size of the plants produced grew all the time, the new constructions were provided with six reactors which made them suitable for the operation of electrolytic installations. The characteristics of such rectifiers and optimum design data are now well known and there can be no doubt that this comparatively new type of rectifier has established itself as the most economic and technically satisfactory source of heavy direct currents at medium voltages.

The article gives a good idea of the many problems which had to be solved in the course of the now concluded development stage, of the analogies with, and intrinsic differences from, mercury rectifier plants, and presents the whole theory of the bridge-connected contact rectifier in a clear and well-considered way. The essentials of the design of the main elements are also collected in a comprehensive tabulation and discussed separately.—" The Characteristics of the Three-Phase Bridge Circuit in Contact Rectifiers," P. Schnecke, *Siemens-Z.*, Vol. 28, No. 10, pp. 445-455, December, 1954, in German.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

Distribution Costs

THE discussion on the paper entitled "A Criterion of Distribution Cost," which was presented by Mr. D. J. Bolton at the Institution of Electrical Engineers on 3rd February (*Electrical Review*, 4th February), was opened by Mr. C. T. Melling (Eastern Electricity Board). His view was that the author's attempt, while a good approach to the question, was subject to severe limitations. There were only 13 sets of data, London being excluded as a special case; and consumer service could not be measured statistically. The author showed that the main characteristic which determined deviation was geographical, but this might be because consumers in certain areas required more consumer service. There were eight important criteria by which the success of an Area Board could be judged, with only one of which the author was concerned, so that his figures could not be taken as a factor of merit. Mr. Melling showed graphs giving the results of some of the other methods of approach.

Mr. T. G. N. Haldane (Merz & McLellan) was of opinion that the author had at least given an approximate yardstick for comparing distribution costs. The geographical effect must probably be regarded as due to conditions which existed at vesting date but which would gradually disappear. The situation had been on the whole less satisfactory in the south and failure of attempts to deal with that position had led to the Act of 1947.

Mr. D. P. Sayers (Midlands Electricity Board) disagreed with the author's suggestion that load factor and sales per consumer were largely outside the control of Area Boards, since they reflected very closely the way in which the Boards had conducted their business. He believed that the cost relationship between north and south also applied to generation.

Alternative Criterion

Mr. G. O. McLean (South Western Electricity Board) put forward an alternative criterion. From a random sample of 194 undertakings from the Electricity Commissioners' returns for 1937, he had obtained a curve which was very nearly Gaussian by means of the formula:

$$\eta = \frac{P\left(1{\cdot}8C + \frac{0{\cdot}27D + 0{\cdot}027I}{240}\right)}{\text{Actual costs } (£)}$$

where P was a population factor (which the author left out altogether), C the number of consumers, D the non-industrial units and I the industrial units.

Dr. F. T. Chapman (South Eastern Electricity Board Consultative Council) thought the author's principles correct, but they entailed several adjustments and needed careful interpretation to avoid misleading conclusions. He hoped that nothing of the kind would be published in the Central Authority's annual report for some years, because he believed the figures would show considerable changes in the next five or ten years. Some of the undertakings taken over had been over-capitalized and some inefficient, but these factors would tend to disappear in the near future.

Mr. R. F. Richardson (B.E.A.) doubted whether demand-related costs should be related to efficiency, because they depended on the Board's maximum demand in any particular year. He reported the assumption that the load factor of an Area Board varied at the same rate as the national average. If account were taken of that factor there was a marked correlation between the author's discrepancy figures and those of the deviation from the average change in load factor.

Mr. G. T. T. Rheam (Associated Portland Cement Manufacturers) pointed out that the author had taken no account of the ratio of the industrial load to the domestic load and the load factor. The author's correction for area to allow for rural districts did not seem logical, because considerable areas of relatively uninhabited land would often be included. A correction based on population per megawatt supplied would take account of potential consumers. He wondered whether the author's yardstick was necessary, when it involved so many assumptions. The consumer judged the performance of a Board by the level of its tariffs, the reliability of its supply and its service, including the avoidance of delay in dealing with inquiries and complaints.

Consumer-Related Assets

Mr. P. Schiller (B.E.A.) remarked that one merit of the paper was that it brought out the importance of asset-related consumer costs, which until recently had been disregarded. The author's figure of £15 per consumer for consumer-related assets outside London was much too low. Bulk supply costs were irrelevant and, as they amounted to about twice the distribution costs, the relative proportion of the discrepancy was reduced to one-third, which was misleading. The author's discrepancy figures were not connected with the efficiency of an Area Board and mainly showed how far off was an appropriate method of analysing and comparing the costs of distribution.

Mr. E. J. Whitcher (London Electricity Board) showed two maps, which indicated that the positions of the "backward" Boards (according to Table 8) and "good" Boards, were reversed if account were taken of the high proportion of industrial units to total units in the latter, which were in the north.

Mr. S. F. Osborne (South Eastern Electricity Board) disagreed that sales per consumer were largely outside the control of Area Boards. Many Boards would never serve the whole of their area, and the adjustment factor should be for area served only. The author's capital figures presupposed a uniform accounting system, which did not exist before vesting date, when the book values did not represent the value of the physical assets. If a Board embarked on large capital expenditure on its network, its efficiency would be reduced, according to the author's yardstick.

Mr. R. Baldwin (*Electrical Times*) recalled some work published in 1951 in which the higher costs of the southern Boards appeared to be connected with the ratio of non-industrial to industrial units. The best fit was obtained with a weighted value for non-industrial units of between 5 and 7, which compared with a figure of 10 given by Mr. McLean. Taking a weighting of 5 for the non-industrial load the figure obtained for non-industrial and industrial consumers gave a ratio of 18 to 1.

Mr. F. H. Dennis (B.E.A.) said that several alternative formulæ had been given that evening, about which agreement was unlikely. It was easier to invent formulæ than to get them accepted.

The author, in reply, agreed that a Board could do much to improve load factor and to sell more kWh per consumer, but said that at any particular moment a demand by consumers for low load-factor supply had to be met, so their efficiency must not be judged adversely because their average price was higher owing to bad load factor.

Electrical Measurements

THE discussion which followed the presentation of papers at a meeting of the Measurements Section of the Institution of Electrical Engineers on 1st February (*Electrical Review*, 4th February) entitled "Electrical and Magnetic Measurements in an Electrical Engineering Factory," by D. Edmundson, and "Current Summations with Current Transformers," by A. Hobson, was opened by Professor J. Greig (King's College, London), who said that his first contact with negative feed-back amplifiers had been in connection with flux measurements. In this the problem was to obtain the accurate rectifier mean value of an induced voltage so small as not to be susceptible to conventional methods of rectification. The amplifier built had good enough phase and amplitude response to give correct reproduction of the waveform for rectification. He was, therefore, interested to hear that highly accurate magnetic measurements could be made with Mr. Edmundson's apparatus, utilizing negative feed-back amplifier technique, in association with a wattmeter. He could confirm the efficacy of the polarized relay technique in relation to iron testing.

Dr. A. H. M. Arnold (National Physical Laboratory) said that a danger arose from the very virtues of the feed-back amplifier, namely, that its perfection might be ascribed to the whole of the equipment. The design of a current transformer to cover a wide range of frequencies was not a simple matter if the required accuracy were 0·1 per cent, but that difficulty could be overcome by putting the amplifier on both sides. Again, the dynamometer itself was not necessarily good, and the amplifier did not make it any more accurate. The voltage divider could be either a capacitance or a resistance divider. The former gave good accuracy at 50 c/s, but at 5,000 c/s took a large amount of current. The design of a resistance divider, however, within such accurate limits was much more difficult.

Professor F. Brailsford (University College, London) pointed out that in the sheet tester described the only return path for flux was by the air leakage path, although the author had mitigated that effect by overlapping the preceding and following sheets of the tester. The curve of flux distribution along the length of the sheet was, therefore, surprising; to obtain uniformity of flux density along a sheet which was 3ft wide and 8ft long with a variation of only 1 per cent seemed an extraordinary achievement. Regarding the author's enthusiasm for the use of a Carpenter relay, he himself had often used a rotating synchronous commutator for precision measurements.

In a written contribution, Mr. F. S. Edwards (Metropolitan-Vickers Electrical Co.) expressed disagreement with Mr. Edmundson's suggestion that capacitance was an unwanted quantity. For instance, in testing a thick slab of a new material he had found that the power factor was only about 0·2, but the permittivity was extremely high—about 20. The material was discovered to have alternate laminations of a good insulator and of an insulator so poor as to be virtually a conductor. The effective area under test was therefore considerably greater than the area of the electrodes. Those characteristics of the material would never have been discovered simply from the power factor. Again, it was surely of value to know how the permittivity changed in any comparative tests, say, on different papers or pressboards or resins.

Mr. L. B. S. Golds (Eastern Electricity Board) agreed with Mr. Hobson that it did not matter where the three, four or five current transformer leads were connected, but the paralleling connection had to be very well made to avoid errors due to contact resistance.

Mr. C. Ryder (Metropolitan-Vickers) attributed the virtue of Mr. Edmundson's system to the amplifier. The crux of the matter seemed to be not so much whether an amplifier could be designed to do the job, but rather whether, when the amplifier was coupled with a wattmeter and used in a test department by people who were not electronic enthusiasts, it could have the same reliability as a standard voltmeter or wattmeter in normal laboratory use.

Mr. R. G. Martindale (Metropolitan-Vickers) said that the introduction of a mutual only removed the problem of phase error from the current transformer to the mutual itself. In iron loss testing with higher harmonics, capacitance between the turns on a multi-turn mutual might under certain conditions lead to error.

Mr. H. S. Petch (British Electricity Authority) stressed the importance of ensuring that parallel feed remained parallel at all times when paralleling the current transformer or summation current transformer.

I.E.E. Birmingham Dinner

THE annual dinner of the South Midland Centre of the Institution of Electrical Engineers was held last Friday at the Grand Hotel, Birmingham. There was a very good attendance and members of the Centre, together with their guests, were welcomed at the reception preceding the dinner by Mr. A. R. Blandford, chairman.

After the loyal toast Mr. Blandford proposed "The City of Birmingham." He began by expressing sympathy for Mr. J. Eccles, President of the Institution, who was unable to attend the function owing to illness. He then said that in this country we had a very high standard of education but it was an unfortunate fact that more students were studying history than engineering. More engineering students should be attracted to the universities and technical colleges. The engineering profession seemed to be doing a bad job of selling and it should make early approaches to young people. If this country was to maintain its marginal scientific lead physical science and industrial technology should be encouraged much more than it had been in the past. The response to the toast was made in humorous vein by Alderman J. R. Balmer, J.P., Lord Mayor of Birmingham.

The toast of the Institution was proposed by Sir Edward Boyle, Bt., M.P., who said that this country's economic position was not nearly so gloomy as so many people thought. The high standard of British engineering was going to stand us in very good stead in the years to come. We could not compete with the United States in mass production but we could where quality products were concerned. Sir Edward also referred to the shortage of technicians and said that any part which electrical engineers could play in bringing to the notice of young people the careers which the profession could offer would be of great value to the nation.

In place of Mr. Eccles, the response was made by Mr. W. K. Brasher, secretary of the Institution. He said that the qualifications for corporate membership of the Institution had become progressively more difficult. The reason was that the standards of entry must keep pace with the requirements of present day electrical engineering if the men were to be worthy and competent in the profession.

The final toast of the evening "Guests and Kindred Societies" was proposed by Mr. H. S. Davison, senior vice-chairman of the Centre and the response was made by Dr. Robert Aitken, Vice-Chancellor, University of Birmingham.

Reconstructed Dutch Railways

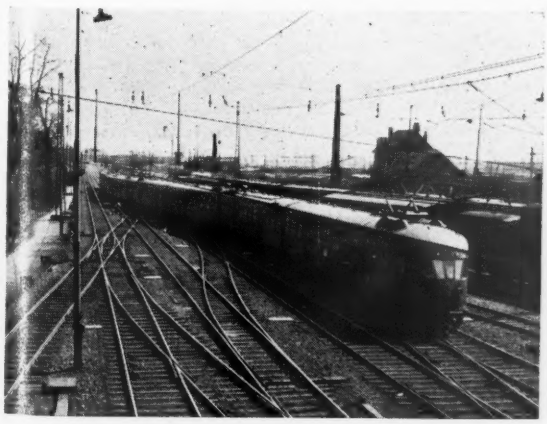
Elimination of Steam Locomotives

IN a paper read before the Royal Society of Arts on 2nd February Mr. F. Q. Den Hollander (president, Netherlands Railways) described the post-war plans for the reconstruction of the railways of the Netherlands. After giving particulars of the provisional repairs carried out between 1945 and 1947 in consequence of the almost total destruction of the system during the war, the speaker dealt with programmes for 1948-1952 and 1953-1958.

Population density, he said, was now 800 per square mile (compared with 540 in the United Kingdom) and in the western part of the country it rose to 2,100, which required fast and frequent services for average travelling distances of 25 miles. Of the total ton-miles of goods transport, 30 per cent was taken by the railways, 53 per cent by water and 17 per cent by road. Unremunerative lines were being progressively closed down.

The decision to eliminate steam locomotives was taken because of the following advantages of electric and diesel-electric traction:—Greater accelerating power; quicker turn-round of rolling stock; possibility of splitting trains into units by automatic central couplers operated only by the driver; use of a larger number of smaller trains, which were more adaptable to traffic conditions; reduction in the number of rolling stock sheds and disappearance of coal yards, water supply apparatus, turntables and complicated station yards, with consequent increase in capacity of station tracks and platforms.

Average availability for service of an electric locomotive was 23 hours a day against 10 hours of a steam locomotive. The percentage thermal efficiency was 18·5 for electric and 22 for diesel-electric traction compared with not more than 6 for steam. Fuel economy was desirable, since the Netherlands could not produce sufficient coal to cover present needs, which would increase in the future.



Electrified yard at Utrecht Central station

Where the train frequency was more than one an hour in each direction and an increase in density was expected, electrification was calculated to be more profitable than diesel-electric operation, in spite of its high fixed costs, and was adopted for all main lines, leaving other lines to diesel operation. The use of hauled trains enabled the electric locomotives employed for freight duties (mainly at night) to draw passenger trains. The urgency programme for 1948 to 1952, hampered by financial restrictions, allowed for the electrification of 525 miles of main lines, multiple-unit trains, locomotives and passenger coaches. By the end of 1953 42 per cent of the track had been electrified to cope with 71 per cent of passenger service and 45 per cent of goods service. Electric locomotives ran a daily average of 230 miles, compared with 90 miles by steam in 1938, with 25 per cent less personnel per 1,000 train-miles. To run to-day's electrified service by steam would entail the consumption of 650,000 more tons of coal. Compared with 1938, the number of passenger-kilometres was 93 per cent more but the number of seats was only 62 per cent of the earlier total. Inland goods traffic was 62 per cent higher with fewer wagons. The tariff for wagon loads had risen by 186 per cent against an increase of 335 per cent for ruling wholesale prices.

For the 1953-58 programme the diesel-electric system would predominate, especially for international traffic. Extensions would include lines from Eindhoven to Venlo and, in co-operation with the Belgian Railways, Roosendal to Antwerp. Standardized diesel-electric trains would, it was hoped, be run on the main connections in Western Europe. Electrification in one form or another would be completed for passenger service this year and for goods traffic in 1958, resulting in a further saving of 350 tons of coal per annum.

Courses for Managers

A THIRD course for managers in industry is being arranged by the University of Cambridge. It will be held in Madingley Hall from 27th June to 22nd July next, and will be open to managers who have some years' experience in industry and commerce and are under the age of forty. The general direction of the course will be in the hands of the same persons as in 1954, and the content will be similar, but more attention will be paid to the aims and attitudes of trade unions and rather less to responsibility and authority in industry, and more use will be made of tutorials and case studies. Details can be obtained from Mr. G. F. Hickson, Stuart House, Cambridge.

Encouraging the Use of Electronics

IN an effort to stimulate industrial interest in new manufacturing techniques the South Wales Electricity Board held a conference on electronics in industry and commerce last week at the Patti Pavilion, Swansea. A similar conference is to be held at the Drill Hall, Dumfries Place, Cardiff, from 16th to 18th February.

The conference, which was attended by over 1,000 representatives from local industries including not only electrical engineers but works managers and production engineers, was unusual in its arrangement. Essentially it was a combination of talk, discussion and exhibition which admirably fulfilled its purpose of providing industrialists in the area with an opportunity of seeing at first hand some of the many applications of electronics in diverse industries and having actual working equipment explained to them.

The success of this type of conference may be judged by a similar one on power factor correction which the Board held last year. During the twelve months following this conference the sales of power factor correction equipment by both manufacturers and the Board exceeded the total sales of the previous five years.

The Swansea conference was opened by Mr. W. A. Gallon, deputy chairman of the Board, after which Mr. W. P. Warren gave a general talk on electronics in industry and commerce. He did not give any detailed technical descriptions of individual equipments and circuits but devoted his time to explaining the general applications of electronic devices from the users' point of view and attempted to show how the problems in installation and maintenance could be overcome. Mr. Warren subsequently took the chair in a " brains trust " wich included Mr. W. Howard (Lancashire Dynamo Electronic Products), Mr. A. Sanders (General Electric Co., Ltd.), Mr. A. Hickman (British Thomson-Houston Co., Ltd.), and Mr. E. Heyes (Metropolitan-Vickers Electrical Co., Ltd.).

The exhibition, which was arranged by twelve manufacturers, showed examples of most of the types of electronic apparatus likely to be required by the local industries. Three short films were also shown. The first, which was made by the British Thomson-Houston Co., Ltd., dealt with general electronic applications, while the other two, which were American in origin, dealt respectively with the Ransberg process of electrostatic paint spraying and radio frequency induction heating.

Nuclear Energy Engineering Course

WE have received from Professor J. Diamond, M.Sc., Wh.Sch., M.I.Mech.E., of the Mechanical Engineering Department, University of Manchester, details of a course in nuclear energy engineering which will be held at the University from 23rd February to 6th April. It is considered that the time has not yet arrived for nuclear energy engineering to be introduced as a separate undergraduate course in the same way as chemical engineering, but certain existing undergraduate courses might take account of the new field. In addition, the introduction of nuclear energy engineering as an optional subject forming part of the normal engineering degree courses is possible and desirable.

The recent rapid growth of the subject has created an urgent need for the instruction of engineers in industry at post-graduate level, especially in the Manchester area, and it is proposed that the need shall be met by nuclear energy engineering courses in the University. The experience gained from the course which begins this month will govern the arrangements for subsequent courses, but at the present time it is thought that one course each year, in the summer, will meet the need among both external students and the University's own post-graduate students.

It is very desirable that there should exist within the universities informed teaching and research in the subject so that the influence of the universities may be extended as much into nuclear engineering as it is into other branches of engineering. At the present time, there is no school of nuclear engineering in any university in the country and consequently the proposed course will depend largely upon visiting lecturers. It is felt that this will not only meet the needs of industry at the present time, but that it will also serve to introduce the subject in detail to the University staff by discussion and lecture. It may be expected that later courses will be less dependent on visiting lecturers and that the experience gained may be turned to good account at undergraduate level.

Following an introductory period commencing at 9.30 a.m. on Wednesday, 23rd February, there will be one-hour morning and afternoon lectures and discussion classes.

The student course fee is £40 which is payable in advance to the Bursar, the University of Manchester, Manchester 13. As the course will take place during the Lent term there will be no accommodation available in the University Halls, but Mr. H. Swales-Smith, of the Registrar's Department, will be pleased to help students to find suitable hotel accommodation. Lunch will be available in the University Refectory. There will be no textbooks for the course, but the following short list of books are recommended for those who wish to read in preparation for the course:—" Introduction to Nuclear Engineering," by Stevenson (McGraw-Hill); " Introduction to Nuclear Engineering," by Murray (Prentice-Hall); " Nuclear Radiation Physics," by Lapp and Andrews (Prentice-Hall); " Sourcebook on Atomic Energy," by Glasstone (Van Nostrand); " Elementary Pile Theory," by Soodak and Campbell (Wiley); and " The Elements of Nuclear Reactor Theory," by Glasstone and Edlund (Van Nostrand).

The following are among the subjects of the lectures:—Nuclear physics and reactor theory; reactor design; shielding; heat transfer; liquid metal technique; reactor control; metallurgy of fuel elements; metallurgy of constructional materials; plant instrumentation; chemical technology; material supply and economics; power plant cycles; and health physics and instrumentation.

Automatic Telephone Plant Maintenance

IN a paper presented before the Institution of Electrical Engineers last evening, Mr. R. W. Palmer (Post Office) gave an account of experiences of maintenance principles adopted for automatic telephone exchange plant. The procedure differed from that of most engineering plant mainly because the finding of faults was much more difficult than their repair. Practices at home and abroad in relation to overhauls, cleaning, routine testing, alarms and monitoring devices were compared in their threefold relationship with service failure (including plant faults) in regard to prevention, disclosure and location, and correction. The design of maintenance aids appropriate to modern technical developments in switching systems was reviewed.

The established policy of preventive maintenance usually included methods of disclosure and location of service failures by routine functional testing. While routine work was more easily supervised by higher levels, it tended to focus too much attention on arrears of routine to the detriment of a more realistic attitude to quality of service. A " qualitative " maintenance policy, as now adopted in the United States, economized effort. Under this policy the work performed was varied locally according to the state of individual plant items, the quality of service required and the skill and temperament of the technical staff. It did away with the need for standard schedules of routine maintenance, and in existing telephone exchanges eliminated much unnecessary work.

In new systems self-testing facilities could be incorporated which would further reduce man-power and improve standards of service. The important factor in every case was an appreciation of what each maintenance function was intended to achieve. This would ensure that efforts in one direction were not unnecessarily stressed or duplicated and that no important feature was overlooked.

ELECTRICAL PROGRESS—1954

Metropolitan-Vickers Electrical Co., Ltd.

DURING last year twenty-seven steam turbo-generator sets manufactured by the Metropolitan-Vickers Electrical Co., Ltd., were put into service. This represents an addition of 563 MW to the generating capacity of thermal power stations. Eight generating sets totalling 375 MW were commissioned for existing stations of the British Electricity Authority. Further 60 MW machines with hydrogen-cooled generators were put into service at Carrington, Chadderton, and Carmarthen Bay. At Brunswick Wharf (Poplar) and at Deptford East further 52·5 MW machines have been commissioned.

Overseas fifteen machines with a total capacity of 178·75 MW have been put into operation, among them being the third 50 MW 33 kV turbo-generator set for Pyrmont (Sydney) in New South Wales; the first of two 30 MW sets for Wilge (South Africa E.S.C.); 20 MW machines at Salisbury (Southern Rhodesia), and at Hok-Un (China Light and Power); and a 15 MW machine for Nchanga (Anglo-American Corporation). A 25 MW 3,600 r.p.m. set is approaching completion for Halifax, Nova Scotia.

New orders received during the year from the B.E.A. include a 120 MW machine for the new Blyth station, the fifth 100 MW set for Castle Donington, and the fourth 60 MW machine for Carmarthen Bay. Overseas orders of special interest include some large machines for Canada, generating at 60 c/s. These are two 33 MW sets for Brandon (Manitoba Hydro-Electric Board) and a 30 MW set for Estevan (Saskatchewan Power Corporation); the generators for Brandon will be hydrogen-cooled and manufactured to American Preferred Standards.

Many a.c. waterwheel generators have been completed during the year. Vertical shaft machines driven by Francis turbines include the first of four 75 MVA 214 r.p.m. machines for San Esteban power station in Spain, three of 27,777 kVA 136 r.p.m. for Whakamaru (New Zealand), and the first of three 15 MVA 500 r.p.m. units for Escales Falls (Spain); horizontal shaft Pelton-driven units include the third of four 37,500 kVA 500 r.p.m. machines for Aura (Norway), and two of 3,750 kVA 1,000 r.p.m. for the Sindh Valley scheme in India. The first of two 7,500 kVA generators for Torr Achilty (North of Scotland Hydro-Electric Board) has been erected and run on load.

Four 30 MVA 1,000 r.p.m. synchronous condensers have been completed and despatched to site, two for Islington (State Hydro-Electric Department of New Zealand), and two for Madrid (Saltos del Sil).

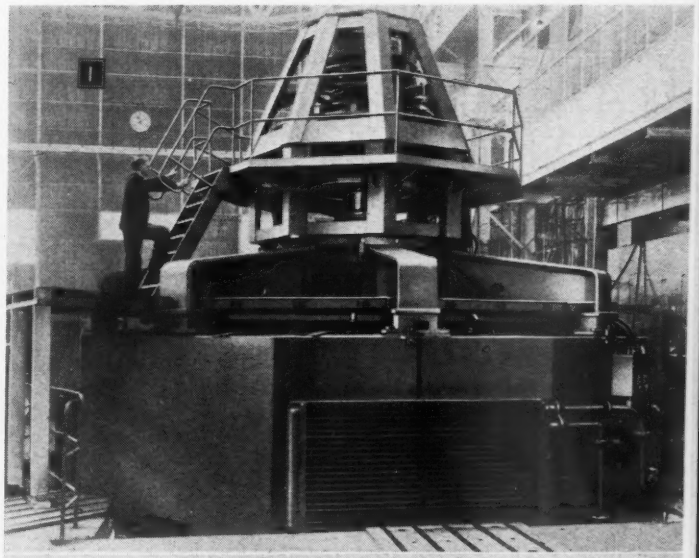
Work in hand includes two machines of 20 MVA for the Electricity Supply Commission of South Africa, two of 20 MVA for the Anglo-American Corporation (South Africa), and one of 30 MVA for Sociedad Hidro-Electrica Espanola (Spain).

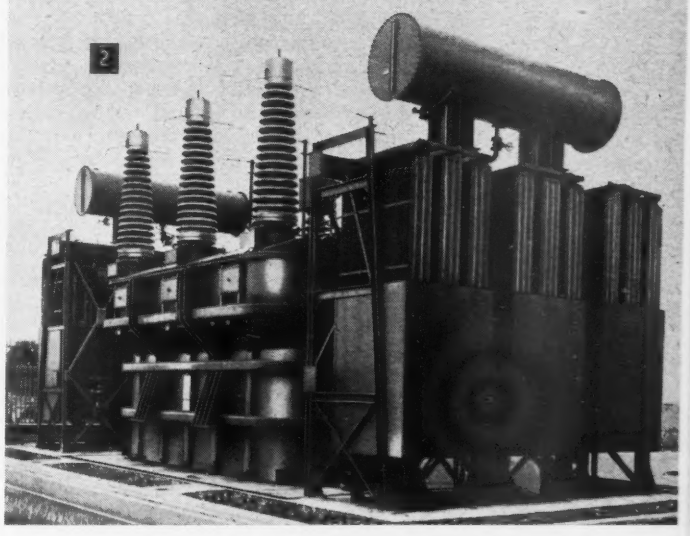
The first three 120 MVA auto-transformers have been built for the B.E.A. and despatched to site; these will be used to link the 132 kV grid and the new 275 kV supergrid. Each unit is fitted with three type H on-load tap-changers at the 132 kV points of the windings to provide a voltage variation of ± 15 per cent in eighteen steps. The first transformer was subjected to a complete set of type tests, including impulse and temperature rise tests, which it withstood successfully; all three units withstood full-scale routine tests.

Construction and testing have continued on the 275 kV 7,500 MVA air-blast circuit breakers, type GA10W8, for the supergrid and seven more breakers have been ordered.

In the oil-break field, the type testing of the HG6MA circuit breaker, rated at 3,500 MVA 132 kV, has been satisfactorily completed for acceptance by the B.E.A. and for A.S.T.A. certification; the B.E.A. has placed orders for eleven of these breakers.

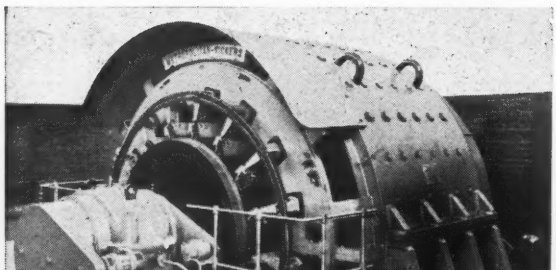
In the heavy metalclad class of single-break non-draw-out type SB units for 22/33 kV, an eight-unit duplicate busbar switchboard for South Africa and a six-unit single busbar





(1) Three of four 27,777 kVA waterwheel generators have been shipped to Whakamaru hydro-electric station, New Zealand

(2) A 120 MVA 275/132 kV outdoor auto-transformer at Carrington substation



A 4,000 h.p. (10,000 h.p. peak) 50/120 r.p.m. d.c. motor driving a roughing mill in a South Wales steelworks

board for the North Western Electricity Board have been installed, both having type SB12 circuit breakers. Single-busbar vertically isolated switchgear type VH is now in quantity production, both V1H air-insulated and V2H compound-filled; a double-busbar version of the compound-filled equipment, type V22H, is being developed.

The first contraphase carrier-current phase-comparison feeder protective equipment has been installed on the British grid system, previous equipments having been operating overseas for two years; more than fifty contra-phase equipments are now under construction. Further orders have been received for carrier current protection of the power-direction comparison type to meet special circumstances. Work has been completed on the largest single contract ever undertaken for high-speed duplicate feeder protective gear; a scheme was developed and type-tested for this contract to meet the stringent service requirements in India.

An example of the wide range of the company's work is a comprehensive contract for changing over the Dalmarnock works of Sir William Arrol & Co. from d.c. to a.c. covering the engineering of the complete scheme and the provision of equipment for three substations (750 kVA transformer, V1RH2R switch unit, and twenty-panel medium voltage board), automatic power factor correction, h.v. and l.v. distribution, plug-in busbar trunking, motor drives (requiring 450 a.c. motors with their associated control gear), and lighting.

A great variety of electric motors and control gear have been in hand during the year. Among the larger a.c. motors are a number of slip-ring induction machines that have been ordered for mine winder drives ranging from 650 h.p. to 4,700 h.p.

Many large d.c. machines have been supplied including generators for 1,815 h.p. and 1,890 h.p. m.g. sets for N.C.B. colliery winders and 2,100 h.p. and 2,200 h.p. m.g. sets for winders in South Africa and Rhodesia. Large d.c. motors put in hand this year include three main mill motors for a universal beam mill for Dorman Long; these are double-armature reversing motors rated at 8,000/22,000 h.p. 800 V 65/160 r.p.m. In the smaller sizes of motor many design improvements have been made, for instance in oil-lubricated bearings for both sleeve and ball and roller bearing machines.

The standard 200, 300, 500 and 1,000 A single-operator arc welding sets have been revised to conform to the new B.S. 638: 1954, and a 400 A welder using metal rectifiers to provide d.c. is in process of development. The use of both automatic and hand welding with the atomic hydrogen arc and the inert-gas arc processes continues to expand in various industries, the atomic hydrogen arc process finding a particular application in the chain making industry.

The application of r.f. heating to the manufacture of p.v.c. belting continues to be investigated. The design of the prototype consolidating machine has been completed, and pre-heating equipment has been designed and is being supplied to enable existing rubber consolidating machines to be used for p.v.c.

There have been notable lighting developments in fluorescent tubular and electric discharge lamps. Increases in efficiency of up to 22 per cent are obtained in the complete range of fluorescent tubular lamps in normal production. The range of 80 W and 125 W mercury vapour fluorescent discharge lamps type MBF is now supplemented by a 400 W size. The life of mercury lamps up to 400 W and of sodium lamps in all sizes has been increased by improvements in manufacturing methods: an average of 4,000 burning hours is now normal.

The company has, of course, been extremely active again in the field of industrial electrification all over the world, the industries involved including steel, mining, oil and petroleum, printing and textile.

A four-stand tandem cold strip mill drive was commissioned in Monmouthshire just a year ago and six large d.c. equipments for seamless tube production have been commissioned in the Midlands. A coil side-trimming line equipment for a steel plant in North Wales has been commissioned, and two others will follow shortly.

The Manchester-Sheffield-Wath 1,500 V d.c. railway electrification scheme is now in full operation. The company's contribution was to supply and erect all the traction motors, control gear, and other electrical equipment on the locomotives, of which there are fifty-eight of the 1,868 h.p. 88-ton Bo+Bo type for mixed traffic working and seven of the 2,760 h.p. 102-ton Co – Co type for high-speed passenger service.

During the year the third 8,000 s.h.p. geared steam turbine, operating at 600 lb/sq in 950 deg F, has been shipped to Caledon Shipbuilding and Engineering for s.s. *Theseus* (Alfred Holt). This is the highest steam temperature employed in British merchant ships, and the set incorporates semi-automatic turning gear, which is remotely controlled from the manœuvring platform.

In science and medicine the company has supplied atomic research equipment, electron microscopes and diffraction equipment, mass spectrometers, particle accelerators and various other items of specialized equipment.

Gas Turbine Research

From Our Cape Town Correspondent

THE Council for Scientific and Industrial Research, Pretoria, states that, bearing in mind the limited supplies of water in South Africa, the gas turbine appears to be an outstanding prime mover for locomotives and power stations. For this source of power to find general application, however, it would be essential for coal to be used as the fuel. In order to find out how South African coal can be used to the best advantage, an apparatus has been developed for the study of the influence of intense sound waves on the combustion of pulverized coal. A new approach to this problem has been made by the design of a thermo-acoustic oscillator which in preliminary tests offered promising possibilities for the efficient burning of powdered coal.

Anglo–South American Trade

Danger of Complacency

SOME impressions of his recent visit to South America were given by Mr. J. P. Ford, chairman of the Council of the Institute of Export, at a meeting of the Institute held at Caxton Hall, London, on 1st February. Mr. Ford, whose trip was sponsored by the Board of Trade and the Foreign Office, said that during his thirteen weeks' tour he covered fifteen countries, and in all his talks (which included broadcasting) he emphasized that Britain could to-day compete on terms of price, quality, delivery and credit.

He was disturbed to find on his return to this country that British deliveries were slipping once again, and he was also worried by the complacent attitude of some British firms who were assuming that they could fill their order books from a number of the large domestic re-equipment programmes. If we ignored South American markets we might freeze ourselves out of them for many years to come. British manufacturers had to rationalize their production programmes so that they not only assisted with the essential domestic re-equipment programme, but also made certain that they were obtaining their fair share of business from overseas markets.

The pattern of our exports to South America was changing. Whereas before the war we exported far more consumer goods, development schemes in these countries now called for capital goods of all types and to-day 80 per cent of our exports to South America were represented by capital goods and manufactures. Mr. Ford instanced some of the development schemes, which included power plant, telecommunications apparatus, machine tools, and all forms of transportation equipment. Referring to growing competition from other countries, he mentioned that during 1954 Germany exported goods valued at £350 million, which was something like three times the amount of British exports. As the demands in South America were largely for capital goods we had either to get in now or be prepared to be barred from some of these markets for twenty years to come.

Mr. Ford referred to payment difficulties and said, in the case of Chile and Brazil particularly, that we had to help them to earn sterling by selling more of their produce to Britain or the sterling area. He was convinced that Brazil would be our largest long-term market in South America and one which might, in the years to come, take the place of certain of our traditional Commonwealth markets which were gradually becoming saturated and building up more and more indigenous production.

Opportunities for British Manufacturers

Recent export figures showed that our biggest market in South America at the moment was Venezuela. Here there were no currency problems and large development schemes were in hand, giving opportunity not only to export goods, but also services such as those offered by contractors and consulting engineers. At the moment British goods represented only 7 per cent of Venezuela's imports. Similarly in Colombia rapid development was taking place and that country could be our second biggest long-term market in South America. In Peru, which completely freed its currency more than eighteen months ago, our exports had gone down successively over the last four years. Much more business could be done if senior British executives visited this and other Latin American markets.

Mr. Ford dealt with the necessity of having good representatives in South America with power to negotiate on the spot. He also mentioned the need for training more South American students and engineers in our universities and factories so that they became used to our equipment and procedures. There was the need for adequate spare parts and service facilities, and he recommended that British concerns should take advantage of the trade fairs now established in South America.

Where some of the South American markets were short of currency, many of our competitors were going in on joint venture schemes and helping South Americans to set up their local industries. This was another matter in which we could make an effort and bring a long-term income to Britain. We could not stop progress and if we did not help the South Americans to set up their own industries our competitors would, and once these industries were set up tariffs or licensing measures would be brought in to support local industry.

Portuguese Electrical Market

THE United Kingdom, although challenged with increasing strength by Germany, has kept its position as the principal supplier of goods to Portugal. Reporting this in his survey (dated June, 1954) on the economic and commercial conditions in Portugal* prepared for the Board of Trade, Mr. W. W. McVittie, Counsellor (Commercial) to H.M. Embassy in Lisbon, forecasts that Portugal will continue to be a good market for many classes of United Kingdom manufactures. In referring to the fact that United Kingdom concerns were not successful in 1953 in securing contracts for hydro-electric plant under the six-year plan, Mr. McVittie says that their prices were higher than those of German, Swiss, Belgian/Luxembourg and French competitors. It is important that British suppliers should realize that this market is becoming increasingly competitive. To meet stronger competition attention must be given to price, to delivery dates and, in the case of capital goods, to the granting of suitable payment terms.

The principal industrial machinery items imported in 1953, and the chief sources of supply, included motors of all kinds (mainly from the United Kingdom, Germany, the United States, France and Italy) and transformers, alternators and turbines (France, Switzerland, United Kingdom and Germany). Radio apparatus (total imports of which average about 49,000 sets per annum) were supplied by Germany, the Netherlands and the United Kingdom.

With the development of hydro-electric power the demand for insulated wires and cables has gradually increased. Imports are mainly of types of wire and cable not manufactured in Portugal. The chief supplier up to the end of 1952 was the United Kingdom, but in 1953 Germany occupied first place, followed by the United Kingdom, Belgium/Luxembourg and the Netherlands. The United Kingdom was the chief supplier of the heavier type of cable.

Dealing with the Portuguese engineering and metal industries, Mr. McVittie says that workshops and foundries have been growing in numbers and capacity during the past few years. The Portuguese associates of a Belgian engineering concern have applied for a licence to establish in Lisbon works to make electric locomotives and electric railcars. Factories in Oporto associated with the Belgian concern make transformers up to 1,100 kVA for 30 kV, electric motors, lifts, switches, etc., and domestic heaters. In Lisbon a new cable factory, in which there is a British interest, has begun to make h.v. cable of up to 30 kV as well as underground and aerial telephone cable. Two other factories make l.v. cable covered with rubber or plastic. Another factory in Lisbon established by a United Kingdom firm produced

* H.M. Stationery Office 4s 6d (by post 4s 11d).

26,000 telephone instruments and 150 private branch exchanges in 1953 as well as relays, uniselectors, resistances, rectifiers and battery chargers. Production of public automatic telephone exchanges of up to 200 lines was to be started in 1954. An American concern has also established a factory which makes some telecommunications equipment. French and Dutch electrical companies have subsidiaries which make electric lamps.

Mr. McVittie deals at some length with the electricity supply situation. At the end of 1953 the total installed capacity of power stations was 694 MW, of which 500 MW was hydro-electric and 194 MW thermal. This compares with 346 MW (153 MW hydro-electric and 193 MW thermal) in 1950. Particulars are given of the main hydro-electric power stations, with the plans for extensions and construction of new stations. Output has risen from 942 million kWh in 1950 to 1,380 million kWh in 1953, and it is anticipated that the demand in 1958 will reach 2,210 million kWh.

The Anglo-Portuguese Telephone Company holds a concession to provide telephone services in areas around Lisbon for a 30 km radius and 20 km radius around Oporto. All Oporto urban exchanges will be converted to automatic operation within three years and the larger Lisbon extra-urban exchanges will also become automatic. The company's expansion programme foresees the installation during the next four years of 59,760 lines and 74,600 stations. The existing automatic exchanges, with one exception, were supplied from the United Kingdom and are of the modern Strowger step-by-step type. Plant construction generally follows similar lines to the British Post Office system. Mr. McVittie's report includes notes on Madeira and the Azores.

Lighting Hazardous Areas

ON 8th February Messrs. A. G. Palmer, B.Sc.(Eng.), A.M.I.Mech.E., A.M.I.Gas E., and W. E. Harper, B.Sc.(Eng.), Ph.D., A.M.I.E.E., presented a paper, "The Lighting of Hazardous and Corrosive Locations in Industrial Plants," to the Illuminating Engineering Society in London. The paper explains that many situations in industry are potentially hazardous because of the possible presence of inflammable mixtures of vapours, gases and dusts with air. Electrical apparatus, including lighting equipment, is one possible source of ignition, and special precautions are necessary both in the design and installation of equipment. The hazard of corrosion is more widespread than those of fire and explosion, but not infrequently the hazards occur together, calling for additional precautions. Where there is risk of fire or explosion, the equipment and installation must satisfy relevant official regulations which are supplemented by a number of British Standards and Codes of Practice.

Probably the most common explosion hazard in industry is where certain vapours and gases may be present in sufficient concentration to form, with air, an incendive mixture. The necessary precautions must be taken even though the presence of such an incendive mixture may result only from an accident or plant breakdown. The most common form of protection for such positions is to install flameproof equipment certified for operating in the particular gas or vapour. But it is sometimes difficult to obtain good lighting when using flameproof fittings, owing to the comparatively low light output of single units, and other methods are therefore frequently used. These include mounting the fittings outside the danger area and lighting by projection, the use of pressurized fittings and the design of plants to eliminate the hazard.

Fire and explosion caused by the ignition of dust and fibre suspensions in air are perhaps less well known than the vapour/air hazards, but this danger is widespread in industry. Where fittings must be mounted within the danger area, dust-tight fittings should be used. There is need for a British Standard specifying the construction and testing of such fittings. In some locations it is necessary to mount fittings outside the danger area and light by projection, although in dusty atmospheres light losses by absorption are usually considerable. Plants can sometimes be designed to reduce the dust concentration to a value which is not dangerous, so permitting normal lighting; modern flour mills are an example. The dangers in plants manufacturing or handling explosives is so much greater than in other industrial plants that special precautions are necessary both for the installation and maintenance of lighting equipment. The type of fitting used in any particular position depends on the process; usually either flameproof or approved dust-tight fittings are specified.

The corrosion of metals and other forms of chemical attack on lighting fittings seldom result in danger, but they affect the performance of equipment and increase replacement and maintenance charges. There are, in general, four lines of defence against chemical attack—choice of materials, protective finishes, design details and maintenance in service. One type of fitting which has proved successful in a very corrosive situation in a chemical plant has a body cast in LM6 silicon-aluminium alloy. Light control is by a refractor bowl and the joints are sealed by rubber gaskets. Among the new protective finishes for the metalwork of fittings, paints based on the epoxide resins appear to offer much improved corrosion resistance. Even so, protection by paints can only be temporary and the use of all-plastic fittings made from correctly chosen materials may prove most effective for corrosive locations. Corrosion can sometimes be greatly reduced by improved plant design which reduces the corrosives in the atmosphere and this has been illustrated by new plants built for the gas industry. Good maintenance is essential for all fittings in hazardous locations and they should be mounted so that access is safe and easy.

Long-Distance Radio Communications

TWO papers on the influence of variations in solar and magnetic activity on the performance of high-frequency radio systems were presented before the Radio Section of the Institution of Electrical Engineers on 9th February.

In the first, Messrs. J. K. S. Jowett and G. O. Evans (Post Office) examined the results of an analysis of commercial time lost, due to disturbed ionospheric conditions, on certain circuits from Montreal and New York to this country during various periods from 1942 onwards. Conditions suddenly deteriorated in September, 1950, and coincided with a sharp decrease of solar activity and the onset of magnetic storms in the M-regions of the sun. The high values of lost time persisted up to the winter of 1953-54, in spite of a possible decrease in magnetic activity. No great improvement, the authors believed, was to be expected until the beginning of the next sun-spot cycle.

The second paper, by Messrs. A. M. Humby (Admiralty, formerly with Cable & Wireless, Ltd.), C. M. Minns (D.S.I.R.) and R. J. Hitchcock (Cable & Wireless), dealt with operational data concerning several long-distance radio-telegraph circuits. It was shown that the lowest operational efficiency did not necessarily occur at the same time as the lowest level of solar activity. Possible reasons were given for seasonal asymmetry of performance in the two directions of a route, which did not lend itself to reliable measurement of magnitude. The effects of ionosphere propagation, atmospheric noise and the path taken by the ray were discussed.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

"Ten Electrical Milestones"

IN selecting his "Ten Electrical Milestones," Mr. Brettelle's task could not have been an easy one. He should not, however, concern himself unduly as to opinions held or assessments different from his own, because surely few people will challenge the wisdom of his choice. Difficult though it would be to select ten from the long list of famous names, it would undoubtedly be even more so to decide the single contribution to engineering for which these men should be remembered.

I wonder if H. W. Clothier has not been misplaced in this respect? It is of course true that Clothier took a leading part in the conception and building of the first switchgear testing station in this country (now the largest in the world); but was not his greatest contribution what he called "ironclad switchgear," brought to Alphonse Reyrolle and Norbert Merz in 1904? This was a basic idea, revolutionary at the time, but now adopted on a world-wide scale.

Clothier's guiding passion was, of course, safety both of life and equipment, and it was this which gave rise to his ironcladding ideas. With what pride and joy did he declare—"22,000 volts—no danger!"

Hebburn, co. Durham. C. F. STEPHENS.

[In his article, which appeared in our issue of 7th January (p. 7), Mr. C. O. Brettelle gave J. H. Clothier chief credit for his work on switchgear testing (the ninth "milestone" in the author's list). The other milestones were:—Filament lamps; the Deptford 10 kV cable; high-voltage transformers; three-phase induction motors; three-phase, four-wire distribution; single-phase watt-hour meters; turbo-alternators; differential protective gear; and elimination of ionizable voids in high-voltage cable insulation. We welcome readers' views on this choice.—Editors, *Electrical Review*.]

Status of Professional Engineers

THE *Electrical Review* is to be congratulated on publishing Mr. F. J. Erroll's excellent and factual article on the industrial progress and status of engineers in the U.S.S.R. It is, perhaps, of interest to note that industrial progress is directly proportional to the status of engineers in the country concerned, and the U.S.S.R., in the person of Mr. Kaganovitch, is one of the few countries that thought it desirable to appoint a professional engineer in the Government. Perhaps a lesson could be learnt from studying carefully the methods of these people in spheres other than purely political or ideological.

It is, perhaps, a little sad to realize that although we live here in a country depending for survival on its industrial inventive spirit and technical efficiency, we disregard the status of the people responsible for progress in these affairs, and rather give the impression that we regard the professional engineer as a necessary evil, whose income and status should show no sign of improvement through the ages.

In these days of higher mechanization, more leisure and less arduous work, the professional engineer, on his return from a day's work, has to spend his relatively long leisure hours greasing and polishing a derelict pre-war car, repair his furniture, dig his garden, sandpaper his floors, etc., because in general he cannot afford to pay the appropriate labour charges for this type of work. He therefore spends his so-called leisure time in performing, inefficiently, tasks for which he is ill equipped, resulting in frustration and loss of creative work on a substantial national scale.

Unfortunately, remarks and comments such as these are only published in the technical Press and are, therefore, only read by the people who express these views. Mr. Erroll could be doing a great service to all if he were to bring his remarks to the notice of the House and the Government.

London, S.W.7.

A. P. VACCA, M.A., A.M.I.Mech.E., A.M.I.E.E.

Shortage of Technologists

THE letters on the subject of third assistant engineers' and showroom supervisors' salaries, written one is able to imagine by men with commercial interests, urge me to the following comments.

One letter in particular contained the statement: "One could put up with a second best third assistant engineer but not a second best showroom supervisor." The majority of third assistant engineers are young men who have obtained technical qualifications and have received intensive training in all sections of the industry over a period of five to seven years. This type of man, of course, does not consider for a moment entering the showroom supervisor field which with its low standard of educational requirements and engineering knowledge, is no achievement.

The third assistant engineer can look forward to far higher salaries than the showroom supervisor who, surrounded by Mrs. Brown's kettle and Mrs. Jones's sweeper has most probably reached the zenith of his career. It is of course obvious that the electricity supply industry could operate just as successfully without every single commercial employee, but not without its engineers.

In fact it is about time that the industry returned to its basic object, the generation, transmission and distribution of electricity, and the commercial man's work, for a long time tolerated under the false cloak of "Consumer Service" and "Load Development," returned to private enterprise where it belongs.

ANOTHER THIRD ASSISTANT ENGINEER.

Showroom Saturday Afternoon Opening

I SHOULD like to bring to your notice an error which has occurred in the *Electrical Review*, of 28th January, 1955, in the first item under "Views on the News." The third sentence from the end reads "The Consultative Council has asked that representatives from the North Eastern Area (where Saturday opening is in operation) should meet the Southern Board to discuss their experience." This is not correct; the Council, in fact, asked the Board to meet representatives of the North Eastern District Committee of the Council, the body from which the recommendation arose, to discuss certain representations, put forward by the Southall Staff Committee, as a preliminary to consideration by the full Council at their next meeting.

The North Eastern District Committee of the Council covers the same territory as the Southall Sub-Area of the Southern Electricity Board and the showrooms in question all lie in that Sub-Area. The item as it stands may have surprised the North Eastern Area Board and Consultative Council.

Maidenhead, Berks. I. A. ROCHE, Secretary.

Electricity Supply in Europe

An Analysis by the Electricity Committee of O.E.E.C.

THE situation of the electricity supply industry in Europe has been studied in a report just published by O.E.E.C. in Paris. It forecasts likely developments in the period to 1958, and gives tables and graphs of production, fuel consumption divided into sections, and power exchange between countries.

Figures given show that the average increase in annual production to 1951 was 9 per cent. Since then the rate of increase has declined and is expected to be about 6 per cent in 1958. Thermal plant has increased at a greater rate than hydro-electric plant, the proportions at present being 60 and 40 per cent in Western Europe. The total installed capacity of all types at the end of 1953 was 79 million kW and annual production 288,000 million for that year. An interesting table gives the proportion of total consumption devoted to traction, and shows a decline in this country from 3·7 per cent in 1947 to 2·2 per cent in 1953. This compares with higher proportions and an increase in the proportion over the same period for most principal countries in Western Europe. Some figures for 1953 are Austria 7·8 per cent, Holland 6 per cent, France 5·1 per cent, Italy 6·8 per cent, Denmark 3·6 per cent, and Switzerland 9·3 per cent.

Prices since 1938 are about 60-70 per cent up and in this respect the industry over the whole continent must have kept its increases well below those of any other. This has been possible by the high efficiency of all new plant, a concentration of production, intensive development of interconnections, and changed rate policies to increase sales. These influences are now felt to be declining and price rises more in step with the cost of living generally seem inevitable.

At the conclusion of its report the Committee draws attention to five problems of importance facing the industry. These are:—(a) The use of hydro resources within limits compatible with economic operation; (b) use of cheap secondary fuels in thermal plant; (c) development of interconnection between countries and increase of power exchanges; (d) development of regions such as overseas territories with cheap power resources; and (e) difficulties of some countries in financing of investment.

World Power Conference

THE final text of the technical programme of the fifth plenary World Power Conference to be held in Vienna from 17th to 23rd June, 1956, has now be issued. It has been drawn up by the Austrian National Committee after taking into account the comments on and the constructive criticisms of the provisional technical programme which were made by the representatives of the National Committees which attended the meeting of the International Executive Council of the World Power Conference held in Brazil in July, 1954. The following are the broad divisional subjects to be dealt with at the Conference, and these are published together with explanatory and guidance notes on the programme:—

Division 1, the state and development of power production and utilization in individual countries; Division 2, the preparation and conversion of fuels; Division 3, utilization of primary sources of energy; Division 4, purification of waste water and waste gas in the production and use of energy; and Division 5, international collaboration in the production and use of energy.

The following is the composition of the committee appointed by the British National Committee to make arrangements for the preparation of British papers. Chairman: Mr. J. Eccles, C.B.E. (deputy chairman (operations), British Electricity Authority). Members: Mr. J. R. Beard, C.B.E. (Messrs. Merz & McLellan); Mr. F. N. Beaumont (British Petroleum Co., Ltd.); Sir John Cockcroft, K.C.B., C.B.E., F.R.S. (director, Atomic Energy Research Establishment); Sir Walter Drummond (deputy chairman, National Coal Board); Mr. Henry F. H. Jones (deputy chairman, Gas Council); Mr. H. G. Nelson (deputy managing director, English Electric Co., Ltd.); Mr. J. A. Oriel, C.B.E., M.C. (Shell Petroleum Co., Ltd.); Dr. A. Parker, C.B.E. (director of fuel research, Department of Scientific and Industrial Research); Mr. V. A. Pask, C.B.E. (chief engineer, British Electricity Authority); Mr. J. S. Pickles (chairman, South of Scotland Electricity Board); and Mr. K. T. Spencer, C.B.E., M.C. (Chief Scientist, Ministry of Fuel and Power).

Communications intended for the British Papers Committee should be sent to: Secretary, British National Committee, World Power Conference, 201-2, Grand Buildings, Trafalgar Square, London, W.C.2.

Water Power in South Africa

A SCHEME to erect a pumped-water hydro-electric station on Table Mountain which would relieve the load on the steam power plants in Cape Town at peak periods, and possibly reduce their coal consumption in winter, is being investigated at the University of Cape Town. Mr. G. H. Webster, lecturer in the Electrical Engineering Department, said recently that the project would use several reservoirs on top of the mountain. Water would be led through a pipeline from the reservoirs down the escarpment, parallel to the original Disa stream, to a hydro-electric generating and pumping station sited near the 500ft contour in the kloof. There a catchment reservoir would be constructed to conserve the water till the off-peak period, when it would be pumped back into the reservoirs ready to relieve the next peak load.

Possibilities exist for hydro-electric development in the Western Cape but it is emphasized that any project for water power can be successful only if incorporated into a system based on the production of electricity from coal. The Palmiet River has a catchment area of 170 square miles and near its mouth there is a valley where 130,000 acre-ft of water could be stored, enough to generate 15 MW for 14 hours daily during the six winter months of the year. At Bain's Kloof a similar scheme with an almost ideal layout is feasible and Worcester has an excellent opportunity for developing hydro-electric power at Stettynskloof where the municipality is at present constructing a dam which could be used as a regulating dam for hydro-electric power without impairing its primary purpose of storing water for the town.

Machine Tool Selection

IN a paper presented before the Manchester Association of Engineers on 4th February, Mr. J. Henderson (C. A. Parsons & Co.) discussed some practical problems associated with the selection of machine tools for heavy engineering production. The examples chosen related mainly to turbo-alternators and their auxiliary equipment. The author emphasized the value of simplicity of design and the importance of the human factor in making full use of any elaborate features, the value of which might be questionable on that account. In the manufacture of capital goods of the kind dealt with, as distinct from mass production of lighter commodities, there was no mechanical substitute for individual experience, ability and industry.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Export Credits Guarantee Department announces that the President of the Board of Trade has appointed **Mr. R. W. Burkitt** to the newly-created post of Deputy Comptroller-General of the Department. Mr. Burkitt has been an assistant secretary in the Board of Trade.

Mr. H. B. Mellor, Associate I.E.E., has recently transferred from the Lighting Department of the Birmingham Office of the British Thomson-Houston Co., Ltd., to the power and apparatus side of the company's business and will operate chiefly in the Potteries area. He joined the B.T.H. Co. in 1947 as lighting engineer in the Leeds district, having previously been chief engineer with the Bective Electrical Co., Ltd., London, and senior installation engineer with the Yorkshire Electric Power Co.

Mr. H. B. Mellor

Mr. R. G. Mills

Mr. R. G. Mills, who until recently was with A.E.I. (India), Ltd., has now been appointed to the B.T.H. Sheffield office as a power engineer. He first joined the B.T.H. Co. as an engineering apprentice in 1942 and afterwards spent some time at the company's Birmingham office and in the Switchgear Sales Department, Willesden, before going to India in 1952.

Mr. J. Nicholson, B.Sc., A.M.I.E.E., has been appointed to the B.T.H. Manchester office as a power sales engineer. After completing his initial apprenticeship with the company, Mr. Nicholson entered Leeds University in 1934, and returned to the B.T.H. Co. for further training in 1937. He served in the Royal Engineers for six years, attaining the rank of captain. Mr. Nicholson returned to the company in 1946 and was appointed to the B.T.H. Sheffield office. In 1951 he joined David Brown Foundries Co., Penistone, as works engineer, but rejoined the B.T.H. Co. at the beginning of this year.

Mr. C. J. Williams has been appointed to succeed **Mr. J. A. Wellings** as manager of the casting division of High Duty Alloys, Ltd. Mr. Wellings relinquishes the appointment on taking up his duties as director and vice-president of Canadian Steel Improvement, Ltd., Toronto.

Mr. L. F. Southorn has been appointed manager of the Sheffield office of C. A. Parsons & Co., Ltd., in succession to **Mr. A. N. G. Wood** who has retired.

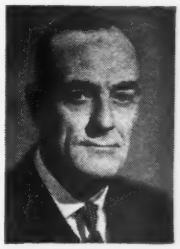
Sir Ronald Matthews has been appointed deputy chairman of the Independent Television Authority by the Postmaster-General. He succeeds **Sir Charles Colston,** who resigned from the post in December last for personal reasons. Sir Ronald is on the boards of several companies, including the Brush Group, Ltd., and General Refractories, Ltd., of which he is chairman.

Mr. J. Nicholson

Lt.-Col. P. W. Dollar and **Lt.-Col. L. A. M. Bates-Oldham** have been appointed directors of Aberdare Cables (Holdings), Ltd.

A dinner to commemorate fifty years' work in the electrical industry by **Mr. Norman Aish** was held recently by Aish & Co., Ltd., Poole, at the Grand Hotel, Bournemouth, 250 members of the staff and guests attending. The speakers included Mr. C. Oxford (director), Mr. D. L. Diggens (senior supervisor) and Mr. G. Beer (foreman electrician). A presentation was made to Mr. Aish by Mr. G. Keeling, a member of the staff for fifty years, on behalf of the employees.

The President of the Republic of Brazil has conferred the Order of the Southern Cross of Brazil — rank of Commander —upon **Mr. R. S. Hex,** F.I.C.S., a regional manager (overseas) of British Insulated Callender's Cables, Ltd., and a member of the Council of the Brazilian Chamber of Commerce and Economic Affairs in Great Britain, of which he was chairman from 1951 to 1953.



Mr. R. S. Hex

Mr. Douglas C. Neillands has been appointed assistant secretary to the North of Scotland Hydro-Electric Board. Mr. Neillands was educated at Daniel Stewart's College, Edinburgh, and Edinburgh University where he graduated M.A., LL.B. He was admitted to the Faculty of Advocates in 1946. He served in the R.A.F. during the war and was seconded with the rank of flight lieutenant to the Special Operations Executive. He was a magistrate in Nigeria from 1944 to 1946 and was assistant legal adviser to Courtaulds, Ltd., London, before joining the staff of the Hydro-Electric Board in 1948.

Mr. H. H. Smith, assistant manager of the Special Vessels Department of Babcock & Wilcox, Ltd., has been

Mr. Norman Aish speaking at a dinner held to commemorate his fifty years in the electrical industry. With him (left to right) are: Mr. J. Johnson (chairman, Aish & Co.), Mr. L. C. Penwill (director and secretary, E.C.A.), Mr. G. Jackson, F.R.I.B.A., and the Rev. Roslin Aish (son of Mr. Norman Aish)

appointed sales manager of Edwin Danks & Co. (Oldbury), Ltd. Mr. Smith was educated at Brighouse and at Halifax Technical College. Following some ten years' experience in boiler manufacture with a Yorkshire firm, he joined the estimating department of Edwin Danks & Co., Ltd. After further experience in various capacities he was transferred in 1938 to the comparatively newly-formed Special Vessels Department of Babcock & Wilcox, being appointed assistant manager of the Department in 1950.

The Council of the Institution of Electrical Engineers has elected to honorary membership of the Institution His Royal Highness the **Duke of Edinburgh,** K.G., P.C., K.T., G.B.E., F.R.S. His Royal Highness has signified his acceptance of this election, and the Council makes this announcement with particular pleasure in view of the interest which His Royal Highness has long shown in science and engineering and their applications.

Colonel G. W. Raby, C.B.E., M.I.Mech.E., M.Brit.I.R.E., has been appointed deputy director (engineering) to the Research Group of the United Kingdom Atomic Energy Authority at Harwell. He will take up his appointment in April. Colonel Raby, who is fifty-four, was previously associated with Sir John Cockcroft in the wartime development of radar and he also advised on workshop layout when the Harwell establishment was being planned. He served as an apprentice with the British Thomson-Houston Co., Ltd., at Rugby, later becoming superintendent-controller, factory. From 1928 to 1934 he was manager of the turbine works of the Richardsons, Westgarth Co. at Hartlepool, and then went to the English Electric Co., Ltd., at Rugby, where he became an assistant general manager concerned with new development and research.

Mr. J. V. Thomas, sales director of Auto Diesels, Ltd., left London by air on 30th January for a comprehensive business tour of South Africa. He expects to return to London in early April.

Mr. H. Finch, M.A.S.E.E., A.S.M.E., and **Mr. P. Rose** have been appointed directors of Volex Electrical Products, Ltd., with effect from the beginning of the year.

Mr. H. Finch

Mr. P. Rose

At the dinner held to celebrate the golden jubilee of Thornhill power station. Left to right: Mr. C. Lumb (mechanical maintenance engineer, Thornhill), Mr. S. R. Siviour (ex-Yorkshire Electric Power Co.), the Mayor of Dewsbury (Councillor E. Harrison), Mr. F. Bates (station superintendent, Thornhill), Mr. C. G. Richards (chief generation engineer (operation), Yorkshire Division, B.E.A.), and Mr. H. H. Hobbs (ex-Yorkshire Electric Power Co.)

In our last issue we referred to the golden jubilee of the Thornhill power station of the Yorkshire Division of the B.E.A. The accompanying picture was taken at the dinner held to commemorate the event.

Mr. S. Tillotson, A.M.I.E.E., manager of the Tees Sub-Area of the North Eastern Electricity Board, is retiring on 31st March after forty-three years in the supply industry. Mr. Tillotson began his career with the Cleveland & Durham Electric Power Co. in 1910 and after serving in the R.N.A.S. during the 1914-18 war he joined the West Hartlepool Corporation Electricity Department. In 1926-27 he held the position of consumers' engineer at Birkenhead, returning in the latter year to West Hartlepool as mains superintendent. He became borough electrical engineer in 1931, which position he held up to vesting day. He was a member of the Council of the Incorporated Municipal Electrical Association and for many years secretary of the North-East England Centre. He also acted as secretary of the A.M.E.E. North-East England Centre and was a member of the National Executive Committee of that body.

Mr. S. Tillotson

Mr. Tillotson is a past chairman of the former Northern Counties Area Committee of the British Electrical Development Association, serving also on the National Council of the Association, and he is present chairman of the Tees-Side Committee of the E.I.B.A.

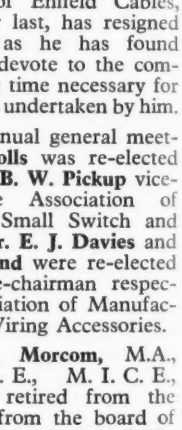
Mr. W. T. Barrow, divisional chief electrical engineer of the North-Eastern Division of the National Coal Board, was presented with a silver tea service at a private dinner party given at Doncaster on 26th January to mark his retirement. The presentation was made by Mr. W. D. Morton, Area 2 (Doncaster) electrical engineer.

Sir John Black, who was appointed deputy-chairman of Enfield Cables, Ltd., in December last, has resigned from the board, as he has found himself unable to devote to the company's business the time necessary for the executive duties undertaken by him.

At the recent annual general meetings **Mr. R. Nicholls** was re-elected chairman and **Mr. B. W. Pickup** vice-chairman of the Association of Manufacturers of Small Switch and Fuse Gear, and **Mr. E. J. Davies** and **Mr. P. E. Wheatland** were re-elected chairman and vice-chairman respectively of the Association of Manufacturers of Electric Wiring Accessories.

Lt.-Col. R. K. Morcom, M.A., C. B. E., M. I. E. E., M. I. C. E., M.I.Mech.E., has retired from the chairmanship and from the board of Daniel Adamson & Co., Ltd., and **Mr. R. W. Parkyn,** managing director, has succeeded him as chairman.

Mr. C. F. Wells, M.I.E.E., A.M.I.I.A., chief commercial officer to the South Eastern Electricity Board, is leaving shortly, having reached the retiring age. After general training with Edmundsons Electricity Corporation and subsequent experience in the generation and sales departments at Dundee, Swindon and Woking, he joined the Yorkshire Electric Power Co. in 1919, becoming sales manager of all the companies in that group. On nationalization in 1948 he joined the South Eastern Electricity Board in his present position. He serves on many national committees, including the E.D.A. Council.



Mr. C. F. Wells

Mr. R. A. Marryat, vice-president of the **Electrical Contractors' Association,** speaking at the annual dinner of the Bristol Branch of the Association on 4th February, said that in the rapid expansion in the use of electricity a careful watch should be kept to see that sufficient installations were made in new buildings. He expressed concern that some authorities were keeping electrical fixtures down to a minimum, and said that because of this practice the Association was producing a set of specifications for fittings in small houses. Proposing the toast of the E.C.A., Mr. S. F. Steward, chairman of the South Western Electricity Board, said selling and shop-keeping were as important as good engineering and sound administration. Salesmanship and service were linked together, he said, pointing out that the more the Board expanded its activities, the more business there was for contractors—and *vice versa.* Every year new records were being set up in the use of electricity. Sales increased by 20 per cent in the first nine months of the current financial year as compared with the corresponding period last year. For the second year this growth in the use of electricity had enabled the Board to offset increased coal costs.

Mr. E. A. Langsdon has rejoined Ionlite, Ltd., as manager of the company. He was previously area manager covering the Portsmouth area of the D. C. Engineering Co., Ltd.

Mr. E. A. Langsdon

The third annual dinner-dance of the Utilization Group of the **I.E.E. North Western Centre** was held at the Free Trade Hall, Manchester, on Friday last. Members and their guests were received by the chairman, Mr. P. A. Breton, A.M.I.E.E., and Mrs. Breton. The function was attended by 170 members and guests, including the chairman of the North Western Centre, Professor E. Bradshaw, M.Sc.Tech., Ph.D., M.I.E.E., and Mrs. Bradshaw, and the vice-chairman, Mr. G. V. Sadler, M.I.E.E., and Mrs. Sadler.

Mr. B. N. H. Thornely, a director of the Northern Aluminium Co., Ltd., has been made secretary of the company, in addition to his present duties. **Mr. E. A. Trigg,** formerly with Aluminum Co. of Canada, Ltd., has been appointed chief financial officer, and **Mr. J. Mason,** formerly assistant treasurer, is now chief accountant.

Mr. D. E. H. Peirson has been appointed secretary of the United Kingdom Atomic Energy Authority.

Mr. G. R. Buckley, general works manager of the Stanton Ironworks Co., Ltd., has been appointed a director of the company.

The Minister of Fuel and Power has re-appointed **Alderman A. Sturgess,** O.B.E., J.P., of Derby, as a part-time member of the East Midlands Electricity Board.

Mr. A. E. Shilling has been appointed director and secretary of the Covered Conductors' Association. Mr. Shilling, who has been its secretary since 1937, joined the Association in 1930 and in recognition of his twenty-five years' service was presented with a

Mr. G. E. Jewell making the presentation to Mr. A. E. Shilling

wrist-watch by Mr. G. E. Jewell, chairman of the C.C.A., at the Association's annual dinner at the May Fair Hotel on 24th January. At the same function a similar presentation was made to **Mrs. M. Dinan** on completion of twenty-five years on the staff of the Association. A wrist-watch was also presented to **Mr. F. Harries** (B.I.C.C.) in appreciation of special services rendered to the Association.

Mr. J. A. Wykes, managing director of **Hoover, Ltd.,** was recently host at a dinner-dance at the Savoy Hotel, London, for the managers and supervisors and their wives from the company's factories at Perivale, Middlesex and High Wycombe, Bucks.

The B.B.C. arranged a "Workers' Playtime" broadcast from Henley's factory at Birtley, Co. Durham, on 27th January. Presented by Geoffrey Wheeler, the artistes who took part included Ken Dodd and Co., Jean Campbell, Leslie Adams, Martin Lukins, and Fred Harries at the piano.

The **English Electric Players,** the dramatic section of the English Electric (London) Social and Sports Club, was formed in March last year, and on Thursday and Friday last they presented their first major production, Noel Coward's comedy "Hay Fever," at Conway Hall, London. There was an understandable nervousness in the early part of the performance of the first evening but the players gradually assumed more confidence as the play proceeded and the second and third acts were very well done. If Bunny Franklin, as Judith Bliss, the theatrical mother of a Bohemian family, mostly impressed, it was because hers was the longest part and also gave the greatest scope, but she was strongly supported by Neil Leslie as Simon Bliss, Madeleine Critchinson (Sorel Bliss), S. W. Stevens-Stratten (David Bliss), Violet Steele (Clara), Tony Holland (Sandy Tyrell), Edith Walsh (Myra Arundel), Bill Powell (Richard Greatham), and Margaret Burton (Jackie Coryton). It was interesting to learn from the programme that the "Players" also designed and constructed the scenery. As a first venture the performances reflected great credit with the promise of better things to come.

The guest speaker at the monthly luncheon of the **Electrical Industries Club** last Tuesday was Sir Harry Pilkington, chairman of Pilkington Bros., Ltd., and president of the Federation of British Industries. He spoke broadly on the future of British industry with particular reference to capital investment.

OBITUARY

Mr. K. H. Shipton.—The death occurred on 30th January at St. James' Hospital, Tredegar, of Mr. Kenneth Herbert Shipton, B.Sc., A.M.I.E.E., who for the last five years was deputy chief engineer in the Switchgear Department of South Wales Switchgear, Ltd., Blackwood. Before going to South Wales Mr. Shipton was for seven years assistant engineer with Crompton Parkinson, Ltd., and also spent two years with the Foster Transformer Co., Ltd.

Mr. Frederick John Serle, an electrical contractor of Taunton, died recently at the age of seventy-three. He was a member of the Taunton branch of the Electrical Contractors' Association and vice-chairman of the Taunton branch of the Electrical Industries Benevolent Association.

Mr. A. E. Lakin.—The death occurred on 21st January, at the age of fifty-three, of Mr. Albert Edward Lakin, shipping manager of the Revo Electric Co., Ltd. He had been with the company for thirty-two years.

Mr. H. S. Carnegie.—The death occurred on Friday last, at the age of sixty-seven, of Mr. Herbert Stirling Carnegie, M.I.E.E., who at the time of his death was acting in a consultative capacity to the directorate of engineering of the English Electric Co., Ltd.

Mr. Archibald Johnston, M.I.E.E., formerly of the Swansea Tramways Co., died on 2nd February in hospital after a long illness.

WILLS

Mr. H. Nimmo, chairman of the Southern Electricity Board, who died on 25th October last, left personal estate in England and Scotland valued at £6,944.

Mr. W. M. B. Furniss, managing director of the Electric Construction Co., Ltd., who died on 8th November last, left £14,238 gross (£7,441 net).

Parliamentary Report

IN the debate on the railways the Chancellor of the Exchequer, Mr. R. A. Butler, said that there was a financial basis to the modernization plan which should provide the railways with a balance in their accounts within the 15 year period in which it was proposed to spend £1,200 million. He said that the British Transport Commission had not asked for a subsidy and the Government did not intend to give one. Over the period the Commission would need to borrow sums of the order of £800 million and this would be done on the market.

Mr. Geoffrey Wilson asked the Minister of Transport what plans had been made to extend the methods of automatic train control used on the Western Region to all other main lines. Mr. Boyd-Carpenter replied that this system had operated well but there were certain difficulties about applying it as it stood to electrified lines. Control equipment was steadily being made more reliable but it had been necessary to re-design certain components in the last few months. A trial stretch had been extended to include the whole of the up and down lines between King's Cross and Grantham. The equipment would be used on other main lines as soon as it had been perfected.

Enfield Line Electrification

Mr. Albu asked the Minister of Transport whether he had yet received a report from the British Transport Commission on the possibility of electrifying the Enfield line before the construction of the Route C tube.

Mr. Boyd-Carpenter replied that a proposal to electrify this line was included by the British Transport Commission in its plan for the modernization and re-equipment of British Railways, and he understood that the project was not now considered to be dependent on the prior construction of Route C.

Mucomir Project

The capital cost per MW of plant to be installed in the Mucomir project of the North of Scotland Hydro-Electric Board, which will be started this year and completed within two years, will be £250,000, the House of Commons was informed last week.

Replying to questions put by Mr. Gerald Nabarro, Mr. Henderson Stewart, Under-Secretary at the Scottish Office, said that this was the cost based on estimates submitted to Parliament. The capital cost of connecting the station to the local distribution network would be negligible because it would be within 20 yards of the existing lines. The cost was less than in some previous schemes but, in any case, this project had exceptional attractions. The expected load factor of the hydro-electric works embodied in the project, based on the installed capacity of 1·5 MW was 68 per cent. The expected saving in coal at a conversion figure of 1·25 lb of coal per kWh of electricity generated was about 5,020 tons annually. If the average figure of 1·35 lb were taken, the saving would be 5,424 tons.

Electricity Supply in Mauritius

Mr. James Johnson asked the Secretary of State for the Colonies, if he would make a statement upon the plan of the Mauritius Government to purchase the generating and distributing plant of the General Electric Supply Co., Ltd., of Mauritius and what was the sum involved in this transaction.

Mr. Lennox-Boyd replied that after protracted negotiations with the company about the purchase of its output, and faced with its intimation that it would cease to supply electricity after the end of 1954, the Central Electricity Board recently offered to purchase the company's undertaking outright. He understood that negotiations were proceeding, and he was not in a position to make any further statement at present.

Monopolies Commission Reports

In the Commons on Monday Mr. Norman Dodds asked the President of the Board of Trade how many reports had so far been received from the Monopolies Commission, and if he would make a statement giving details showing what action he had taken designed to reduce prices or improve quality resulting from the reports.

In the course of a written answer the Minister, Mr. Peter Thorneycroft, said the subject of the supply of electric lamps was referred to the Commission in March, 1949, and its report was received in September, 1951. After enumerating the Commission's recommendations (*Electrical Review*, 16th November, 1951), Mr. Thorneycroft said that the Government accepted all the Commission's recommendations except one calling for the abolition of aggregated quantity rebates on which they preferred to reserve judgment, and E.L.M.A. took action to bring their arrangements into conformity with the Government's conclusions.

The supply of insulated electric wires and cables was referred to the Commission in March, 1949, and it reported in April, 1952.

The Associations concerned had undertaken to bring their arrangements into conformity with the Commission's conclusions (*Electrical Review*, 4th July, 1952), save for two minor ones which the Government felt unable to endorse. The General Post Office was taking action to give effect to the recommendation that provision should be made for the continuance and development of efficient independent competition in the purchase of land telephone cable by the G.P.O., and the attention of the British Electricity Authority had been drawn to the Commission's conclusions on mains cable.

The supply and export of electrical and allied machinery and plant had been referred to the Commission in April, 1952, but no report had yet been received. The supply of electronic valves and cathode ray tubes was referred to the Commission in December, 1954. No report had been received yet.

Herbert Committee

Mr. Arthur Palmer asked the Minister of Fuel and Power when the Committee of Inquiry into the working of the electricity supply industry, under the chairmanship of Sir Edwin Herbert, was expected to report.

Mr. Geoffrey Lloyd replied that he understood the Committee was making satisfactory progress but it was too early to say when it would report.

Barra and North Uist Schemes

Mr. Stewart informed Mr. Malcolm Macmillan that the Hydro-Electric Board's surveys for distribution schemes on the islands of Barra and North Uist were nearly complete and it expected to invite tenders for the work in the spring or summer. Subject to tender prices being satisfactory the Board hoped to extend the Barra scheme to Vatersay and the North Uist scheme to Bernera and Grimsay.

Blue Book

The 1955 edition of the Electrical Trades Directory — the *Electrical Journal* "Blue Book"—is similar in arrangement to last year's edition. It is divided into thirteen sections covering all branches of the electrical industry. The directory has more than doubled its size since the war, and to the list of manufacturers 260 names have been added this year, bringing the total to over 6,600. The numbers of engineers, contractors, wholesalers and distributors also show increases. References in the products and materials section now exceed 45,000. Particulars are included of the United Kingdom Atomic Energy Authority and other related bodies. The trade names section now contains more than 5,300 names of patented products.

The directory is published by Benn Brothers, Ltd., Bouverie House, Fleet Street, London, E.C.4, at 50s post free.

Potash Production

The Saskatchewan Government has announced the signing of a five-year agreement to supply electric power to the Potash Company of America, which is drilling east of Saskatoon. If mining operations are successful it is estimated that the annual consumption of power at the potash plant will be approximately 60 million kWh by 1958.

VIEWS on the NEWS

By REFLECTOR

SOME of my older readers will remember the " Electrical Engineer's Ballad Book " which appeared during the first decade of this century and caused a great deal of amusement. I have been lent a copy of some extracts from this collection published in 1930 by the Croydon Cable Works, Ltd. Many of the verses are still of live interest although they deal with the trials and tribulations of an earlier generation of engineers, particularly the trials—and errors. Omar Khayyam and Rudyard Kipling were the models for much of the material; " J.H.C.B." (initials which many will easily recognize), who was responsible for quite a few of the " poems " was inclined to favour Kipling, which is not surprising as he was founder of the Kipling Society.

* * *

" Your Questions Answered " is a section of the " East Midlands Electricity Journal " in which officers of the East Midlands Electricity Board reply to matters raised by readers. One of the latter compared electricity advertising unfavourably with gas and asked whether a more forcible " popular appeal " would not help to improve sales. To this Mr. N. F. Marsh, chief commercial officer, responded: —

> " It is doubtful whether the popular or humorous appeal would be a good thing for our advertising. It is easier for the brewers to follow that line but I doubt if you would really like to see on the hoardings a District Manager balancing a cooker on his nose in emulation of seals connected with a well-known bottled beverage."

Mr. Marsh pinned his faith to emphasis upon the indispensability of electricity, the attractiveness of electrical appliances and the low cost of electricity. He was not averse, however, to the use of " glamour," pointing out that the Board's latest poster showed an attractive young lady in addition to the all-important cooker.

* * *

" It cannot happen here " might justly be said of some trouble experienced by American electrical " utilities." In a recent issue the *Electrical World* asks " Are You Ready for a Heat Storm ? " and goes on to detail the difficulties which beset American supply engineers. It says: —

> " Adversity tests the stamina of an engineer—and his distribution system. Striking this time in the guise of a protracted heat wave, it proved that air conditioning can boost electrical loads far beyond expectations. Despite generous provision for predictable demands distribution systems suffered costly damage."

As nothing is said of strain upon generating plant I presume that a sufficient supply of power was available; the shortage was on the distribution side. Otherwise I might have suggested that there was a good case for a transatlantic power cable.

* * *

A long time has elapsed since I last heard of attacks on overhead line poles by woodpeckers. I suppose that the damage done by these birds is not so widespread here as it is in some other countries—Sweden for instance. In a note I have had from that country it is said that the careful attention given to the national forests has greatly reduced the numbers of decayed trees which form acceptable nesting places for woodpeckers. So, looking around for something easier to operate on than healthy trees, the birds turn their attention to the dry seasoned wood of overhead line poles. Neither impregnation with creosote nor steel wire protection is effective in keeping them away and as a result frequent renewals are necessary. As the power lines often traverse roadless uninhabited forests, inspection of the poles is a difficult job and so the State Power Board has put helicopters into service for this purpose. By this means 120 miles of route can be inspected in a day; formerly it would have taken three men two months to do as much.

* * *

" Our Daily Bread " has been the subject of a long correspondence in the *Manchester Guardian*. Most of the letters have been bitterly critical of the soggy loaves so frequently supplied nowadays and a number of reasons have been advanced for this state of affairs. Probably the most far-fetched of these is that the " factory-made " sliced and wrapped loaf is designed to fit automatic electric toasters. It is conceivable that this may be true of the shape and size but toasters should not be blamed for deterioration of quality.

* * *

A letter in the *Daily Record and Mail* (Glasgow) commenting on under-voltage supplies says: —

> " Alternatively, to get a better light at 190 colts using 240 volt lamps, they must use higher wattage lamps."

Surely the writer meant higher *horse-power* lamps.

* * *

Various methods of preventing flocks of starlings from congregating on public buildings have been tried here—live wires, alarms and lights among them. The *Manchester Guardian* mentions another system tried out for ridding the American Sherwood Forest of its starlings: —

> " Two loud-speakers were set up in the trees and whistles were given out at 10,000 cycles, at which frequency they are said to have deafened the birds—which soon disappeared—while being inaudible to human ears."

I can only say that this must refer to very poor human ears and that I think the birds could easily put up with a 10 kc/s whistle.

* * *

Unwise prophecy was dealt in by the Chairman of the Chester United Gas Co. in an address to his shareholders sixty years ago. He was reported by the *Electrical Review* of 15th February, 1895, to have said: —

> " There was no doubt that electric lighting during the last 15 years had made very great strides, but there was a strong opinion among engineers competent to judge upon the matter that there was not likely to be any great advancement made in the means and expense of supplying electric lighting. Although the strides made by the electric light had been very rapid and continuous, there was a very strong opinion that the improvements in manufacturing the electric light were pretty well exhausted."

INDUSTRY AND THE HOUSE

Debate on Atmospheric Pollution

By A. M. F. PALMER, A.M.I.E.E., M.P.

THE Clean Air Bill of Mr. Gerald Nabarro, Conservative member for Kidderminster, who had such good fortune in the ballot for Private Members' Bills, has rightly attracted a good deal of attention. This is probably because the public generally, not special opinion alone, has at last become conscious of the dangers of national fuel waste with its associated dirt and menace to good health. Also, there is something audacious in the way in which Mr. Nabarro has run ahead of his own Government in proposing legislation to apply the main recommendations of a highly controversial official Report.

Most informed people, of course, took it for granted that the Report of the Committee on Air Pollution would need careful ministerial consideration before it could be thought of in parliamentary terms. Many of the Committee's proposals involve public finance; others affect a number of interests such as local government and the nationalized industries; time is needed for discussions to take place. Nobody was therefore surprised—it had been forecast for some weeks—when, following an intervention in Friday's debate by Mr. Duncan Sandys, the Minister of Housing and Local Government, Mr. Nabarro withdrew his Bill in exchange for the promise of a comprehensive Government measure during the present session. Those concerned, including presumably the British Electricity Authority, now have a short interval in which to put their objections and suggestions through the appropriate channels.

Cost of Smoke Pollution

In an excellent speech introducing his Bill the Member for Kidderminster recalled that in 1307 a Royal proclamation prohibited workmen in the City of London from using "sea-coals" in their furnaces. The House was glad to have Mr. Nabarro's assurance that the present Bill contained no penalty of a capital character, since in the 14th century he stated the execution of a smog offender was recorded. More seriously he pointed out that the Beaver Committee estimated the cost of smoke pollution to the nation to be £250 million a year. Britain still burned coal more wastefully than any other nation, and black smoke went in company with this inefficient combustion. His Bill was "Beaver, nearly the whole of Beaver and practically nothing but Beaver." If precedents were sought he could say that it followed clauses already included in a large number of local Acts of Parliament. Mr. Nabarro contended that the cost to private industry would not necessitate any subsidy from public funds. Fuel conservation was in itself a sound investment.

A prominent Labour supporter of the Bill, Mr. Alfred Robens, an ex-Parliamentary Secretary to the Ministry of Fuel and Power, as well as a former Minister of Labour, said that a comprehensive Government legislation would have the blessing of the Opposition; they would do all they could to hasten its passage through Parliament.

Two Labour Members from the Potteries, Dr. Stross and Mr. Ellis Smith, as a matter of tactics moved the rejection of the Bill. To them it did not go far enough. Dr. Stross—a medical practitioner—remarked that the public in the industrial areas wanted resolute action backed by strong Government powers.

A Conservative critic of the Bill came forward in the person of Mr. Higgs, who sits for Bromsgrove. He said he had an instinctive reaction against proposals which invaded people's homes and condemned them for ever to gas or electric fires, or the burning of non-existent smokeless fuels. To impose a punishment of six months' imprisonment or a fine of £500 for coal burning was something which in Britain needed careful scrutiny and substantial justification.

The Minister, Mr. Sandys, declared that if a new law was to be "knowledgeable, practical and reasonable," then it must be devised and framed in close consultation with those who were going to be most practically affected. Talks had already started, were going ahead satisfactorily, but were not yet complete. He forecast that the Government Bill would follow the general lines of the Beaver Report, although that would not preclude them from considering additional or alternative proposals. Whether the Bill would pass through all its stages in the present session would depend on how far it proved to be an agreed measure; judging from the debate the prospects seemed good.

Restrictive Practices

The Opposition have returned to the House of Commons after the Christmas recess in a critical mood over restrictive practices in industry, including the methods of trading associations and the use of the stop list. In a comprehensive reply the President of the Board of Trade, Mr. Peter Thorneycroft, stated he hoped to receive by the middle of the year the Monopolies Commission report on tyres and on other allegations of discriminatory practices, including stop lists and exclusive dealing. He added, diplomatically, that he thought it best to await these reports before making up his ministerial mind on possible action.

Mr. Thorneycroft's Labour predecessor at the Board of Trade, Mr. Harold Wilson, complained of progress being deplorably slow. Was the Minister aware of the strong public feeling over some of the cases which had recently received publicity? Did not the Minister agree with the statement made by the Labour Government that it was essential to introduce general legislation banning malpractices such as existed in the "length and breadth" of British industry? Mr. Thorneycroft, however, countered by saying he did not think anybody would suggest that general legislation should be introduced in advance of the Monopoly Commission's report.

Two Conservative Members, Mr. Reader Harris and Mr. Erroll, had a rather different approach to these controversial matters. Mr. Harris wanted to know if, in view of some of the "tendentious accusations," the Minister would resist attempts by what he described as "old boys of the London School of Economics" to wreck methods which were giving good service to the public? Mr. Erroll enquired innocently what happened to a manual worker when he tried to do a job below the union rate?

Further detailed questions were put by both Liberal and Labour Members on the supply of motor tyres and petrol and oil prices. But Mr. Thorneycroft still took smiling refuge behind the Monopolies Commission and their coming report.

Air Pollution Debate

WHEN Mr. Gerald Nabarro's Clean Air Bill was debated in the House of Commons on Friday Mr. Duncan Sandys, Minister of Housing and Local Government, after drawing attention to the lack of financial powers which must hamper a Private Member's Bill dealing with such a complex subject, promised that the Government would introduce a comprehensive Bill following the general lines of the recommendations of the Beaver Committee on air pollution during the present Parliamentary session. This announcement obviously pleased Mr. Nabarro who withdrew his Bill after hearing Opposition spokesmen declare that when the Government Bill was introduced they would help to get it passed into law as quickly as possible.

Moving the Bill, Mr. Nabarro said that the cost of smoke pollution to the nation was estimated by Sir Hugh Beaver to be about £250 million a year. Direct losses were incurred by damage to buildings and paintwork, excess damage to stocks of goods, excess replacement of household goods, additional lighting in smoke-affected areas, extra medical services, extra laundering, and the corrosion of metals in establishments of all descriptions. In this connection the British Electricity Authority estimated that it had to spend £834,000 a year to combat the corrosion of metals. Indirect costs arose from transport losses, delay, and congestion caused by fogs, and the retarding of the growth of foodstuffs. If his Bill were implemented the cost to the nation in capital investment over 10 or 15 years would be about £50 million a year to recover an estimated loss of £250 million a year, excluding coal, which was a complete justification of the policy he sought to promote.

On sulphur pollution, Mr. Nabarro said that many people thought any attempt to abate smoke was valueless unless it dealt with the parallel problem of the emission of sulphur fumes. One could not burn coal, coke or fuel oil without emitting sulphur in the form of sulphur dioxide and, to a lesser extent, sulphur trioxide. There was no known method of removing them except in large establishments such as power stations, and even there the cost was very high for the re-equipment.

An amendment which would have had the effect of negativing the Bill, if carried, was moved by Dr. Barnett Stross, who believed the Bill was not sufficiently radical or comprehensive. He said the crux of the problem in dealing with smoke was to find enough smokeless fuel for the householder.

Mr. Angus Maude said that he did not believe there was as much scope for changing over from solid fuel to gas and electricity for continuous space heating as many people believed. They had to go a long way farther in controlling and regulating the emission of smoke from power stations before he would view with satisfaction a large switchover from coal-burning appliances to electricity in residential areas.

Mr. Sandys, in giving the Government's point of view, said that if the Bill was to be workable and reasonable it must be framed in close consultation with those who would be most practically affected. In particular there must be close consultation with local authorities, industrialists, trade unions and various technical boards whose advice was needed. The Government had started these consultations, following its decision to implement the Beaver Report, but they were not complete. The Government thought that it would be better and would avoid confusion to have a comprehensive Government Bill and this would be introduced as soon as the consultations were concluded. It would follow the general lines of the Beaver Report, but that would not preclude the Government from considering additional or alternative proposals. It would have the financial provisions needed to make it effective. He could make no promise about the date of its introduction but there would be no delay and it would be introduced this Session.

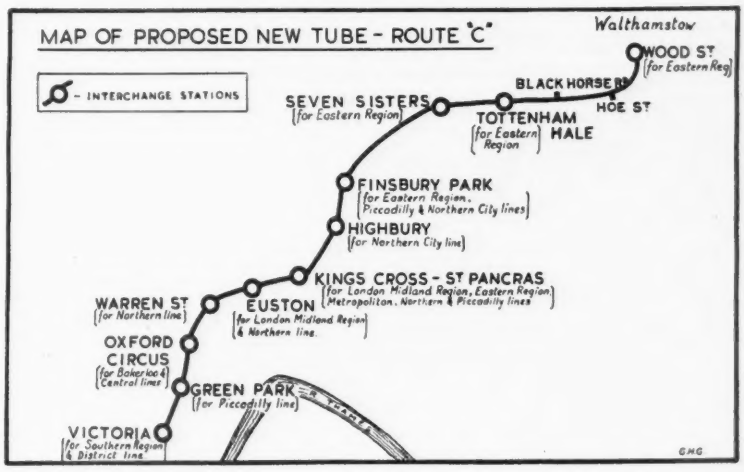
For the Opposition, Mr. Philip Noel-Baker, said they would help to get the Government Bill through quickly.

Proposed New London "Tube"

A British Transport Commission Private Bill introduced into Parliament this session includes enabling powers for the construction of the first stage of a new London tube railway, Route "C." These powers are being sought to enable London Transport to complete their working plan and so be in a position to proceed with the construction of the new railway if and when a decision to carry out the scheme is reached.

The proposed tube, which if built will be central London's first new tube for nearly half a century, is one of those recommended by the London Plan Working Party set up by the British Transport Commission in 1948 to study the capital's rail transport problems. The length of this section of Route "C" would be just over eleven miles, with stations at Victoria, Green Park, Oxford Circus, Warren Street, Euston, Kings Cross, Highbury, Finsbury Park, Seven Sisters, Tottenham Hale, Blackhorse Road, Walthamstow High Street and Walthamstow Wood Street. Except for a short section at the Walthamstow end, it would be entirely in tunnel at depths mainly between 45 and 60ft. The intention is to provide 12ft diameter tunnels to take standard tube type rolling stock. The main objects of the line are to relieve congestion in the central area by giving an urgently needed south-west north-east link across the West End; to take account of the considerable commercial development in that area during the past fifty years; to relieve West End congestion generally; to give a direct Underground link between Victoria and the main line termini at King's Cross, St. Pancras and Euston; to give improved transport facilities for North-East London and to relieve congestion on the section of the Piccadilly line between Finsbury Park and the West End.

Diagram of the proposed new tube railway


MAP OF PROPOSED NEW TUBE - ROUTE 'C'
Walthamstow
WOOD ST (for Eastern Reg)
BLACK HORSE RD
HOE ST
- INTERCHANGE STATIONS
SEVEN SISTERS (for Eastern Region)
TOTTENHAM HALE (for Eastern Region)
FINSBURY PARK (for Eastern Region, Piccadilly & Northern City lines)
HIGHBURY (for Northern City line)
KINGS CROSS - ST PANCRAS (for London Midland Region, Eastern Region Metropolitan, Northern & Piccadilly lines)
WARREN ST (for Northern line)
EUSTON (for London Midland Region & Northern line)
OXFORD CIRCUS (for Bakerloo & Central lines)
GREEN PARK (for Piccadilly line)
VICTORIA (for Southern Region & District line)
GHG

INDUSTRIAL NEWS

E.I.B.A. Golden Jubilee

The golden jubilee of the Electrical Industries Benevolent Association is being celebrated by a luncheon at the Connaught Rooms, London, W.C.2, on 19th April. The principal guest will be Sir John Maud, K.C.B., Permanent Secretary to the Ministry of Fuel and Power.

The President of the Association, Sir John Dalton, will receive guests at 12.30 and lunch will be at 1 p.m. Applications for tickets accompanied by a remittance of one guinea each and a list of guests should be addressed to the Secretary, 32, Old Burlington Street, W.1. As there is likely to be a large demand for tickets, early application is advisable.

Electricians' Wage Claim

A claim for a "substantial increase" in wages of electricians employed in the electrical contracting industry was made on 2nd February by the Electrical Trades Union at a meeting with representatives of the National Federated Electrical Association. The latter made an offer of 2d an hour but Mr. F. Foulkes, general president of the E.T.U., rejected it and said that they would have to consult the members upon their attitude to the offer. A proposal to submit the matter to arbitration was not accepted by the E.T.U.

The present rates of pay for journeymen electricians in the industry are 4s 2½d an hour in the Grade "A" area (London), 3s 10½d in the Mersey District and 3s 9½d in the Grade "B" area (the rest of the country). Adult mates' rates range from 3s 6¼d (London) to 3s 0½d. These rates date from 15th March last year when after "guerilla" strikes increases of 2½d an hour were conceded.

Thorn Electrical Expansion

For the further expansion of its facilities for the manufacture of Ferguson television receivers and "Atlas" lighting equipment Thorn Electrical Industries, Ltd., has purchased another nine acres of land at Enfield, Middlesex. The site, at the junction of Great Cambridge Road and Southbury Road, is only a few hundred yards from the existing factory and work will shortly begin on a building of 80,000 sq ft for additional television receiver production and for Government contract work which includes dollar contracts for the N.A.T.O. forces. Plans include the erection of a four-storey warehouse of 140,000 sq ft, improved amenities for employees including new canteen premises, and a new electronics laboratory for research into colour television and cathode-ray tubes. Designed in contemporary style, with glass and coloured tile exterior, the new laboratory will be specially air-conditioned to suit the type of work to be carried out there. Notable features of the architects' design include an illuminated central tower and an ornamental lake with underwater colour floodlighting.

F.B.I. and the Budget

Representations made to the Chancellor of the Exchequer in advance of the Budget by the Federation of British Industries, 21, Tothill Street, London, S.W.1, have been published in booklet form (1s). The Federation says that although industry has been helped by greater availability of materials, elimination of restrictions and the 1953 Budget reliefs, a further considerable decrease in taxation is essential if industry is to take necessary risks in modernizing and expanding.

Accordingly it recommends reductions in income tax rates and in the overall burden of profits tax; an increase of the investment allowance on industrial buildings to 20 per cent; substantial reductions of purchase tax; a reduction in the estate duty on private limited companies; and a reduction of the duty on fuel for the road transport industry. Reasoned arguments for these concessions are given.

Automatic Oil Burner Plant Controls

The Danfoss Manufacturing Co. is holding a meeting on 14th March at Film House, 142, Wardour Street, London, W.1, at which a lecture will be given on the company's automatic electrically-operated controls for oil burner plants. The lecture will be accompanied by lantern slides and a new Danfoss film will be shown. Applications for admission cards should be made to the company's branch office, 69, Victoria Street, London, S.W.1.

Brazilian Activities

Referring to the article under the above heading in the *Electrical Review* of 4th February, Canadian-Brazilian Services, Ltd., tell us that the Forcacava station is now known as Nilo Peçanha. The capacity of the Lages power station illustrated on p. 173 is 154 MW, not 330 MW as stated; the figure of 330 MW applies to Nilo Peçanha, which is an underground power station and is not visible in the photograph.

Not a "Goods" Vehicle

At the North Walsham (Norfolk) Magistrates' Court last week a summons against Mr. Roy L. Dormer for driving a 15 cwt van carrying "goods" at 45 to 50 m.p.h. was dismissed. A constable giving evidence said that when he stopped the van he found that it contained two boxes containing electrical equipment and a tool chest.

The defendant, who pleaded not guilty, said that he was not carrying goods and his solicitor also said that the equipment could not be regarded as goods within the meaning of the Road Traffic Act. Mr. Dormer was the employee of a nationally-known firm which had a fleet of vans carrying transformer-testing equipment. Any ruling that these were goods vehicles would result in a breakdown of its service.

Russians to Build Indian Steelworks

Last week an agreement was signed by Indian and Russian Government representatives by which the Russians will provide iron and steel plant in the state of Madhya Pradesh. This will have an initial annual output of 750,000 tons, rising to a million tons. The estimated cost is said to be the equivalent of £32 million and payment will be made in twelve annual instalments, interest being paid on the outstanding balance.

Electric Motors for South Africa

The Brush Electrical Engineering Co., Ltd., Loughborough, has received an order for electric motors, totalling 4,800 h.p., from Vaal Reefs Exploration & Mining Co., Ltd., South Africa. The motors are of the high torque, squirrel cage, induction type, in 27 sizes ranging from 60 to 250 h.p. They will be used for gold mining, driving crushers, and similar works. The order was placed through Brush Aboe (Southern Africa), Ltd., the Brush Group's subsidiary company in Johannesburg.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £163 0s 0d
COPPER, H.C. Electro	ton £338 15s 0d
Fire Refined 99·70%	ton £336 0s 0d
Fire Refined 99·50%	ton £335 0s 0d
COPPER Tubes ..	lb 3s 3¾d
Sheet	ton £410 15s 0d
H.C. wire and strip ..	ton £388 0s 0d
LEAD, English ..	ton £104 15s 0d
Foreign	ton £103 0s 0d
MERCURY	flask £109 0s 0d
TIN, block (English) ..	ton £719 10s 0d
ZINC, G.O.B. Foreign	ton £90 15s 0d
Electrolytic	ton £97 10s 0d
BRASS Tubes (solid drawn)	lb 2s 7⅛d
Sheet	ton £323 15s 0d
Wire	lb 3s 2¼d
PHOSPHOR BRONZE Wire	lb 4s 8⅞d
PLATINUM	oz £29 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 30½d—30¾d

English Electric in U.S.A.

It is reported from Washington that the English Electric Co., Ltd., has put in a lower tender for the supply of six generators for the Chief Joseph Dam than four American concerns. The English Electric quotation is $5,460,361; the nearest American bid, that of the Westinghouse Electric & Manufacturing Co., is $6,338,491. The tenders are to be "evaluated" by the Defence Department which will take into consideration the margins allowed between American and foreign tenders.

Scottish Dairy Show

The use of electricity in the dairy, and in particular its low cost in practice, will be the main theme of the joint display by the Electrical Development Association and the South East Scotland Electricity Board at the Scottish Dairy Show, which is being held at Kelvin Hall, Glasgow, from 15th to 18th February. The equipment shown will be typical of that required by two types of dairy farmers, those with 20-cow herds and those having 40 cows, and in each case detailed examples will be displayed of the cost of using electric sterilizing and water heating. Another section will be devoted to "Electricity in the Farmhouse," displaying the "Four Foundations of Modern Living"—the electric cooker, the electric water heater, the refrigerator and the washing machine—in a modern farmhouse kitchen. There will also be a complete home laundry featuring such appliances as a tumbler dryer, a press iron, a drying cabinet, and a washing machine of the type suitable for rural families.

James Beresford & Son, Ltd., will be displaying various types of pump for use by the farmer and country dweller, and their exhibits will include the Beresford patent submersible electric pump for raising water from wells and boreholes

Delivery vehicles to be shown by Smith's Delivery Vehicles, Ltd., will include the company's NCB electric "Commuter" and a new model 18/20 "55" dairy truck.

E.M.I. Electronics Development

Emitron Television, Ltd., has changed its name to E.M.I. Electronics, Ltd. The new company will be a controlling and co-ordinating company, and will absorb as subsidiaries the three existing companies, E.M.I. Engineering Development, Ltd., E.M.I. Factories, Ltd., and E.M.I. Research Laboratories, Ltd. Its directors are:—Messrs. J. F. Lockwood (chairman, Electric & Musical Industries, Ltd.), L. J. Brown (managing director, Electric & Musical Industries, Ltd.), G. E. Condliffe (managing director, E.M.I. Research Laboratories, Ltd.), C. Metcalfe (managing director, E.M.I. Engineering Development, Ltd.), J. B. Stevenson (managing director, E.M.I. Factories, Ltd.), and S. J. Preston (Patents Division, Electric & Musical Industries, Ltd.). E.M.I. Electronics, Ltd., will be concerned with the design, development and marketing of all electronic devices other than those for Government requirements. Under Mr. W. C. Morgan as manager, it will unify control of the existing E.M.I. electronic products.

Duty-Free Entry of Machinery

The President of the Board of Trade has appointed a Consultative Committee on the Duty-free Entry of Machinery in accordance with the recommendation by the Wilson Smith Committee. The Committee consists of six industrialists, three with experience mainly as makers of machinery, and three with experience mainly as users of machinery, a trades union representative and representatives of the Board of Trade and Ministry of Supply. The chairman is an Under-Secretary of the Board of Trade, and the Board of Trade and the Ministry of Supply will provide joint secretaries.

Compensation for Power Station Accident

A sum of £16,262 damages and costs was awarded by Mr. Justice Ormerod in the High Court on 1st February to Mr. Albert P. Davies, London, E., aged 38, for injuries sustained while he was working as a steel erector at Poplar power station in January, 1952.

At the time Mr. Davies, who was an employee of Fraser & Chalmers, Ltd. (against whom the damages were awarded), was helping to dismantle a three-ton crane. A derrick which was being used collapsed and as a result Mr. Davies suffered spinal injuries which incapacitated him for the rest of his life. The Judge held that the company was negligent in not providing adequate stakes to hold the derrick guy ropes.

An order was made for the immediate payment of £600 to Mr. Davies and a stay of execution for 21 days was granted in respect of the remainder of the damages.

Chambers of Commerce Manual

The need for a work of reference which will give the business man and his staff accurate and up-to-date information on the various problems which may arise has been a long felt want and the Association of British Chambers of Commerce has now published the first edition (1954-55) of "The Chambers of Commerce Manual" in which it has successfully endeavoured to give reliable information and data that are most frequently needed.

The volume of over 700 pages is divided into seven parts. The first describes the organization and functions of the Chamber of Commerce movement, gives a directory of United Kingdom Chambers and shows their links with Chambers of Commerce overseas. The next gives commercial information on taxation, commercial law, banking, currency, labour and employment.

The fuel and power industries are dealt with in the third section which gives details of the functions and constitution of the three nationalized industries, coal, electricity and gas, with the names of the Board members and the chief officers. The section dealing with the electricity supply industry covers the British Electricity Authority, the Area Boards, the North of Scotland Hydro-Electric Board and the Consultative Councils. Particulars of the National Industrial Fuel Efficiency Service are also given. The fourth section relates to the national transport services.

Exporting and importing and overseas trade generally forms the fifth section, and includes information on such matters as trading agreements, payments, controls and overseas representation. Information on the British Commonwealth and Empire is given in the sixth part, and the final section is a detailed glossary and index.

The work is strongly bound and well produced and it should prove a valuable addition to the business man's bookshelf. Copies are obtainable from the editorial and publishing offices of the Manual, 9, Gough Square, Fleet Street, London, E.C.4, price £2 10s.

New E.A.W. Branch

A branch of the Electrical Association for Women was formed at Northwood, Middlesex, at a meeting held in the Electricity Service Centre on 27th January under the presidency of Lady Citrine.

Aluminium Centenary

From 1st to 11th June, at the Royal Festival Hall, London, the aluminium industry is to present a progress exhibition, not only to mark the centenary of aluminium as a commercial metal but to demonstrate how the present vast output and unique experience already gained are now being applied to every industry in increasing measure. The exhibition will be divided into five sections —historical; research; production; present day use of aluminium; and the future of aluminium. It is sponsored by the Aluminium Development Association.

Canadian Cable Makers Charged

The trial has opened in Canada of a number of electrical wire and cable manufacturers on charges of operating a combine to fix prices. They are the Northern Electric Co., Ltd., Canada Wire & Cable Co., Ltd., Filcrest Co., Ltd. (formerly Phillips Electrical Works, Ltd.), Automatic Electric Sales (Canada), Ltd., Canadian General Electric Co., Ltd., Cables, Conduits & Fittings, Ltd., Federal Wire & Cable Co., Ltd., Triangle Conduit & Cable (Canada), Ltd., Industrial Wire & Cable, Ltd., and Boston Insulated Wire & Cable Co.

Mr. John D. Arnup, special prosecutor, said that the companies controlled between 90 and 99 per cent of Canadian wire and cable business and that each year they produced goods

valued in excess of $108 million. For a number of years, Mr. Arnup said, the Canadian concerns had an agreement with British companies that kept the British out of the Canadian market through higher prices charged on British goods. He alleged that during the years when the Government claimed that the companies illegally conspired to operate a combine, they met regularly and arranged "actual or tacit agreements as to prices."

Patent and Design Rules

We referred last week to the amendments made by the Board of Trade in the rules governing patents and designs which increase fees and introduce a new schedule of prescribed forms. The Orders effecting these alterations are the Patents (Amendment) Rules, 1955 (S.I. 1955 No. 117, H.M. Stationery Office, 1s 9d) and the Designs (Amendment) Rules, 1955 (S.I. 1955 No. 116, 9d).

Rubber Cable Prices Raised

It is announced by the Rubber and Thermoplastic Cable Manufacturers' Association that its members have found it necessary to increase the prices of their cables, wires and flexible cords as from 28th January. The increases range from 2½ to 17½ per cent.

Power Farming Conference

The 5th National Power Farming Conference will be held at the Royal Hall, Harrogate, on Tuesday, Wednesday and Thursday next week. Thirteen papers will be presented, including "Electricity on the Farm," by Mr. S. F. Steward, and "Mechanical Handling," by Mr. R. Hall. A civic reception and dance will be held on Wednesday and a Conference dinner and dance on Thursday. Further information can be obtained from *Power Farmer*, Dorset House, Stamford Street, London, S.E.1.

Henley Exhibition

We reproduce a photograph of the exhibition arranged by W. T. Henley's Telegraph Works Co., Ltd., at the Russell Hotel, Southampton Row, W.C.1, mentioned in our last week's issue. The exhibition is open from Monday to Friday (2.30 to 7 p.m.) until 25th February.

The superstructure of a 3,600 h.p. electric locomotive, one of seven ordered from the English Electric Co., Ltd., by the Central Railways of India, being unloaded at Bombay. The mechanical parts were manufactured by Vulcan Foundry, Ltd.

Trade Announcements

Brookhirst Switchgear, Ltd., has appointed the British Engineering Manufacturers' Alliance (1952), Ltd., P.O. Box 16, Port-of-Spain, Trinidad, British West Indies, as its accredited agents in Trinidad and British Guiana. This agreement is effective for two years commencing 12th January last.

Aluminium Union, Ltd., announces that branch sales offices have been opened at Gazette Buildings, Corporation Street, Birmingham (telephone: Central 1446) and at National House, 36, St. Ann Street, Manchester (telephone: Blackfriars 9772/3). The Birmingham office is in charge of Mr. W. J. Cadd and the Manchester office in charge of Mr. A. W. K. Lees.

The address of the Luton Branch of **John E. Dallas & Sons, Ltd.,** radio and electrical wholesalers, is now 15, Stanley Street, Luton (telephone: Luton 2275).

Kennion, Irvine & Co., Ltd., 75 Victoria Street, London, S.W.1., announce that they have concluded arrangements under which they are in a position to supply certain items of specialized railway track equipment including "Vibromax" electric railway ballast tampers; Solus-Schäll ultrasonic cathode ray rail flaw detectors; and Schorling rail surface grinding machines. These items are of foreign origin but for the most part the agreements entered into envisage the manufacture at home of those which are not already in production in this country. Mr. W. R. Kennion, A.M.I.E.E., was formerly sales director of Permali, Ltd., and Mr. J. E. Irvine was formerly in charge of railway sales with the same company.

George Richards & Co., Ltd., Broadheath, nr. Manchester, manufacturers of horizontal boring machines, vertical boring mills, planing and other machines, have appointed **Alfred Herbert, Ltd.,** Coventry, as sole distributors of their products throughout the world.

Besson & Robinson, Ltd., have moved to East Industrial Estate, Harlow, Essex (telephone: Harlow 25231/4).

Part of the Henley Exhibition at the Russell Hotel

Communications in Nigeria

The Nigerian Posts and Telegraphs Department has placed an order for telecommunication equipment valued at more than £20,000 and is now carrying out extensions at the training centre at Oshodi—eight miles from Lagos. When the extension work is completed, the centre will take four times the present number of trainees. There is no shortage of trainees but there are not enough instructors to cope with the work of training the technical staff urgently required by the Department. Four more instructors are expected to join the staff within the next twelve months, raising the number to eleven.

Electronic Accountancy

Multiplying at a speed of 7,000 calculations an hour, a new electronic machine recently installed in British Railways (London Midland Region) works accountant's office at Crewe is a valuable addition to the variety of punched card equipment used in the office to control stores ledger and

other work. This machine, manufactured by Power-Samas and known as the "Emp" (electronic multiplying punch) is one of the first to be made for the practical application of electronics to everyday commercial problems as opposed to the very expensive electronic "brains" used by universities and other institutions for research. The machine is self-checking, all calculations being done twice simultaneously, using entirely different methods, thus ensuring that different electronic circuits are used. These two products are then compared and only if they are identical is the answer punched into the card. The total value of stores stocks covered at Crewe is of the order of £4,500,000; the annual turnover is over £25,000,000 and to record the movements concerned in this task, to provide control, statistical information, and allocation for expenditure purposes, upwards of 10,000,000 transactions are involved.

Radio Beacons for Portugal

For some years past the lighthouse service along the coast of Portugal has been augmented by the use of Marconi radio beacons. In compliance with regulations laid down at the 1951 Conference for the Re-organization of Maritime Radio Beacons, the Portuguese Lighthouse Department is to duplicate its existing radio beacons, and has placed an order with Marconi's Wireless Telegraph Co., Ltd., for four duplicate equipments of the latest design. The equipments on order are 20 W M.F. beacon transmitters, Type RB.109. They will be installed at the lighthouses at Montedor, on the northern part of the Portuguese coast, Cabo Espichel, near Lisbon, Cabo Sines, and Vila Real de Santo Antonio, which lies in the extreme south close to the Spanish frontier. The single Marconi beacons at these points are being moved to other lighthouses along the Portuguese coast to provide duplicate equipments there also.

Hoover Training Scheme

Hoover, Ltd., operates comprehensive training schemes which cover nearly all grades of employees and deal with both initial training and training for new tasks and responsibilities and promotions. A new feature is a direct student apprentice entry of boys who have obtained advance level passes at the general certificate of education examination in physics, pure mathematics and applied mathematics and who wish to train as mechanical or electrical engineers. The age for entry is eighteen years and applications are considered up to mid-February in each year. The training of these student apprentices is to aid them to become planning engineers and design engineers who will, it is hoped, subsequently become an important source from which senior supervisors and managers will be recruited. The three years' training for these apprentices is being carried out by "sandwich" type courses, six months at the Perivale factory alternating with six months at Enfield (Middlesex) Technical College.

Canadian Inspection Service

It has been announced that Charles Warnock & Co., Ltd., and Hersey Laboratories, Ltd., of Canada, have been merged under the title of the Warnock Hersey Co., Ltd. As a result, it is claimed that the new company will become one of the largest inspection, appraisal, and testing companies in Canada, serving the construction, manufacturing, railroad, pulp and paper, petroleum, public utilities and other fields. A new head office and laboratory building has been opened in Montreal, and a branch office and laboratory in Edmonton, Alberta.

The company has entered into the new fields of non-destructive testing by the use of X-ray and ultrasonic devices, through which flaws in metals and other materials can be detected up to 17ft from the surface without recourse to drilling or other laborious methods.

Light in Medicine

Application of light in medicine was discussed by Dr. J. G. Fox at the meeting of the Liverpool Centre of the Illuminating Engineering Society on 18th January. Dr. Fox described various instruments with electric light sources, mainly from batteries, used for diagnostic purposes and traced the development of instruments by which clinicians have been enabled to see hollow organs situated inside the body.

A.S.E.E. Ladies' Night

Members of the Association of Supervising Electrical Engineers are reminded that the ladies' night will be held on 25th February at the Trocadero, Piccadilly Circus, London, W.1 (6.30 for 7 p.m.), and will include dinner, dancing and a cabaret. Applications for tickets (35s each for members and their ladies, and 42s each for non-members) should be made as early as possible to the general secretary of the Association, 23, Bloomsbury Square, London, W.C.1.

E.A.W. Conference

The thirtieth annual conference of the Electrical Association for Women will be held in April next. At a soiree on the evening of 26th April, at the Royal Institution, Albemarle Street, W.1, the resident professor and director of the laboratory, Sir Lawrence Bragg, will give an address on "Thirty Years of Electrical Progress." On the following day, the thirtieth annual luncheon and annual general meeting will be held at the Connaught Rooms, W.C.2.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 19th February:—

VICTOR. No. 719,285, Class 7. Electrically operated hammer drills, etc.—Victor Products (Wallsend), Ltd., Church Bank Offices, North Terrace, Wallsend-on-Tyne.

AGA. No. 715,859, Class 9. Scientific, nautical, surveying and electrical apparatus and instruments; radio and television apparatus; sound transmitting, recording and reproducing apparatus; electric arc welding apparatus and welding electrodes.—Svenska Aktiebolaget Gasaccumulator, Lidingo, near Stockholm, Sweden. Address for service, c/o Urquhart-Dykes & Lord, Maxwell House, 11, Arundel Street, Strand, London, W.C.2.

PARK. No. B728,845, Class 9. Electrical contacts, contact breakers and condensers for ignition devices and for magnetos, etc.—Park Brothers, Ltd., Bankfield Works, Ordnance Street, Blackburn.

METAMETER. No. 729,165. METAVANE. No. 729,166, Class 9. Apparatus and instruments for use in controlling, indicating, recording and measuring electrical values, pressure, temperature and rate of flow of liquids and gases, liquid level, draught, humidity and pH value.—Bristol's Instrument Co., Ltd., Lynch Lane, Weymouth.

NIKAD. No. 732,697, Class 9. Sound amplifiers, battery chargers and electrical and electronic apparatus and instruments, but not including measuring apparatus.—J. H. Dakin, trading as Nikad Supplies, 13, Church Road, Edgbaston, Birmingham, 15.

PYRECO (design). No. 733,316, Class 9. Electrical measuring instruments.—H. Elliss, trading as Pyrometric Equipment Co., Unity Works, 49, High Street, Market Harborough.

BYLOCK ELECTRAVAC. No. 734,289, Class 9. Electric suction cleaners.—Bylock Electric, Ltd., 109 South Street, Enfield, Middx.

ROWLWAY. No. 735,156, Class 9. Sound recording and sound reproducing apparatus; radio receiving and transmitting apparatus; and coin or counter freed apparatus.—Sedlescombe Engineering Co., Ltd., The Street, Sedlescombe, near Battle, Sussex.

REPITROL. No. 735,698, Class 9. Electric and electronic repeating apparatus; electrical apparatus for automatically regulating pressure, temperature and speed by means of electric current control.—K. G. Crack, trading as Repitrol, 45, Church Crescent, Finchley, London, N.3.

NASHTON. No. 736,463, Class 9. Thermostats, automatic temperature regulators, time registering apparatus, electric time switches, time recorders (metronomes), switches, switchboards (complete), electro-dynamic apparatus for the distance control of switches, current transformers, relays, radio amplifying valves and thermionic valves.—Nash & Thompson, Ltd., Oakcroft Road, Tolworth, Surrey.

PAYU. No. B730,726, Class 11. Electric lamps and parts of lighting installations.—Howards (Newcastle), Ltd., 14-22, Pitt Street, Newcastle-on-Tyne.

MEKELOND. No. 736,396, Class 11. Electric lighting installations.—Mek-Elek Engineering, Ltd., 17, Western Road, Mitcham, Surrey.

MICAFIL. No. 713,814, Class 17. Mica and materials containing mica, transformer cylinders, transformer and switchgear bushings and sleeves, all for electrical insulating purposes.—Micafil A. G. Werke für Elektro-Isolation und Wicklerei - Einrichtungen, Zurich, Switzerland. Address for service, c/o Marks & Clerk, 57-58, Lincoln's Inn Fields, London, W.C.2.

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 231, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 14th February

BIRMINGHAM. — Imperial Hotel, Temple Street, 6 p.m. I.E.E. South Midland Supply & Utilization Group. "Aluminium Sheathed Cables," by P. M. Hollingsworth and P. A. Raine.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Supply Group. "The Electrical Revolution," by Dr. L. G. Brazier.

DUNDEE.—Mathers Hotel, 7.30 p.m. Incorporated Plant Engineers, Dundee Branch. "Thermal Insulation," by D. I. Smith.

LEICESTER.—Demonstration Theatre, Electricity Offices, Charles Street, 7 p.m. Leicester Electrical Society. "Electrical Equipment in Ships," by R. E. Crick.

LONDON.—Savoy Place, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "Teaching Faraday's Law of Electromagnetic Induction," opened by P. Hammond.

21, Albemarle Street, W.1, 5.30 p.m. Chadwick Public Lectures. "Clean Air," by Sir Hugh Beaver.

MANCHESTER.—Grand Hotel, 5.45 for 6 p.m. Informal gathering of electrical commercial travellers, arranged by the Electrical Trades' Commercial Travellers' Association.

NEWCASTLE-UPON-TYNE. — Neville Hall, 6.15 p.m. I.E.E. North-Eastern Centre. "The Possibilities of a Cross-Channel Power Link between the British and French Supply Systems," by D. P. Sayers, M. E. Laborde and F. J. Lane.

RUGBY.—Laurels Club, Dunchurch Road, 7.30 p.m. I.E.E. Rugby Students' Section. Film evening, introduced by F. Szekely.

SHEFFIELD. — The University, Western Bank, 6.30 p.m. I.E.S. Sheffield Centre. "Some Aspects of Industrial Lighting from a Factory Inspector's Viewpoint," by D. E. Jones.

Livesey Clegg House, 7.30 p.m. Junior Institution of Engineers, Sheffield & District Section. "Blast Furnace Plant and Operational Problems," by E. A. Cotterill; and "Electrical Equipment and Services for the Blast Furnace Plant at the Park Gate Iron and Steel Works," by H. Demaine.

STONE.—Duncan Hall, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "A Transatlantic Telephone Cable," by Dr. M. J. Kelly, Sir W. Gordon Radley, G. W. Gilman and R. J. Halsey. (Joint meeting with the Stone/Stoke Centre of the Institution of Post Office Electrical Engineers.)

Tuesday, 15th February

BATLEY.—Technical College, 6.30 p.m. I.E.E. North Midland Education Discussion Circle. Discussion on "j Notation," and "Graphical Methods," opened by R. A. H. Sutcliffe and T. R. Lupton.

CAMBRIDGE.—Cavendish Laboratory, 8.15 p.m. I.E.E. Cambridge Radio Group. "Colour Television," by L. C. Jesty.

CHELMSFORD.—Public Library, 7 p.m. I.E.E. London Students' Section, district meeting. Film evening.

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South East Scotland Sub-Centre. "High Voltage Cables," by J. S. Hastie.

GLASGOW.—I.E.E. South-West Scotland Students' Section. Visit to Babcock & Wilcox, Ltd., at 7.30 p.m.

INVERNESS. — Burnetts Tearooms, 42, Academy Street, 7.30 p.m. I.E.E. North Scotland Sub-Centre, district meeting. "Natural Sources of Energy," by J. E. Whittaker.

LIVERPOOL.—9, The Temple, 24, Dale Street, 6.30 p.m. I.E.S. Liverpool Centre. "Design and Application of Flameproof Lighting Equipment," by D. A. Strachan.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Measurements Section. Informal lecture on "The Service Engineer at an Atomic Energy Establishment," by W. E. Harris.

Grosvenor House, W., 6.30 for 7 p.m. Electrical Contractors' Association. Annual dinner.

Lighting Service Bureau, 2, Savoy Hill, 6.30 p.m. Association of Supervising Electrical Engineers. "Cathodic Protection," by Dr. W. F. Higgins.

35, Grosvenor Place, S.W.1, 11.30 a.m. Electrical Association for Women, London Branch. Annual general meeting, followed at 1 p.m. by buffet lunch and at 2.15 p.m. by "New Frontiers for Women," by Miss N. Balls.

MANCHESTER. — Electrical Engineering Laboratories, The University, Dover Street, 6.15 p.m. I.E.E. North-Western Utilization Group. "A Brushless Variable-Speed Induction Motor," by Prof. F. C. Williams and E. R. Laithwaite.

RUGBY.—College of Technology & Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre. "The Electrification of the Manchester-Sheffield-Wath Lines, Eastern and London Midland Regions, British Railways," by J. A. Broughall and K. J. Cook.

SWANSEA.—South Wales Electricity Board's Showrooms, The Kingsway, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. Students' Evening: Three informal papers by student members.

Tuesday, 15th February, to Thursday, 17th February

HARROGATE.—Royal Hall. National Power Farming Conference.

Wednesday, 16th February

LONDON.—I.E.E. London Students' Section. Visit to Broadcasting House, Portland Place, at 2.30 p.m.

At the Institution of Mechanical Engineers, Birdcage Walk, 6 p.m. Institution of Heating and Ventilating Engineers. "School Heating," by J. B. Dick.

MANCHESTER. — Engineers' Club, Albert Square, 6.45 p.m. I.E.E. North-Western Radio Group. "An 8 MeV Linear Accelerator for X-ray Therapy," by C. W. Miller.

Engineers' Club, Albert Square, 7.30 p.m. A.S.E.E. Manchester Branch. "Relays and Automatic Control in Industry," by Dr. W. L. Stern.

MIDDLESBROUGH.—Cleveland Scientific & Technical Institute, Corporation Road, 6.30 p.m. I.E.S. Tees-Side Group. "The Design and Application of Flameproof Lighting Equipment," by D. A. Strachan.

NOTTINGHAM. — E.M.E.B., Smithy Row, 7.30 p.m. A.S.E.E. Nottingham Branch. "Development and Application of Time Switches," by E. M. Selley.

PRESTON.—N.W.E.B., 19, Friargate, 7.15 p.m. I.E.S. North Lancashire Group. "Lighting for Sport," by A. Wilcock.

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. "Recent Ideas and Experiments in Magnetism," by Prof. L. F. Bate.

SOUTHAMPTON.—Polygon Hotel, 8.15 p.m. A.S.E.E. Southampton Branch. Technical films.

WIMBLEDON.—Guild House, 32, Worple Road, 8.15 p.m. A.S.E.E. South West London Branch. "The I.E.E. Regulations," by J. J. Looker.

Thursday, 17th February

CARDIFF.—Institute Buildings, Park Place, 6 p.m. South Wales Institute of Engineers. "The Design and Construction of the Uskmouth Power Station," by T. H. Wood.

DARLASTON.—At F. H. Lloyd & Co., 7.30 p.m. Institute of Industrial Supervisors, Wednesbury & Darlaston Section. "Electronics in Industry," by H. D. Irving.

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "New Design of Control Installations for Transmission Stations," by G. M. Mulhern and D. W. O'Neill.

LIVERPOOL.—At the Royal Institution, Colquitt Street, 7.15 p.m. Incorporated Plant Engineers, Merseyside & North Wales Branch. "Electronic Control," by G. Horsfall.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Utilization Section. "An Introduction to the Study of Servo-Mechanisms," by P. J. Bhatt; "The Development of 50 c/s Traction in France," by E. J. Davies; and "Electricity Applied to Oil Production," by G. Gascoigne.

PORTSMOUTH.—City Council Chambers, Clarence Parade, 6 p.m. I.E.E. Southern Centre. "The Owen Falls, Uganda: Design and Construction of Hydro-Electric Scheme," by T. A. L. Paton and R. G. T. Lane. (Joint meeting with the Institution of Civil Engineers.)

TONBRIDGE.—Rose & Crown Hotel, 8 p.m. A.S.E.E. Kent Branch. Film show.

TORQUAY.—Electric Hall, 3 p.m. I.E.E. South Western Sub-Centre. "Submerged Telephone Repeaters for Shallow Waters," by R. J. Halsey and F. C. Wright.

WATFORD.—Clarendon Hotel, Station Road, 8 p.m. A.S.E.E. Watford Branch. "Electricity in the Brewing Industry."

Friday, 18th February

BELFAST.—Grand Central Hotel, 7.15 p.m. I.E.E. Northern Ireland Centre. Annual dinner-dance.

LONDON.—Connaught Rooms, W.C.2, 12.15 for 1 p.m. Electrical Trades' Commercial Travellers' Association. Annual luncheon.

Caxton Hall, 6.30 p.m. E.P.E.A. Southern Meter Engineers' Group. "The Repair of Electricity Meters," by W. Jones and F. A. Miles.

Pepys House, 14, Rochester Row, 7 p.m. Junior Institution of Engineers. "The Atom," by S. A. McAuliffe.

MANCHESTER. — Engineers' Club, Albert Square, 6.30 p.m. Institution of Heating and Ventilating Engineers, Manchester & District Branch. "Electrical Storage Heating, a Recent Installation," by G. Fisher.

Saturday, 19th February

LONDON.—I.E.E. London Students' Section. Visit to London Fire Brigade Headquarters, Lambeth, at 2.30 p.m.

OXFORD.—Y.M.C.A., 10, George Street, 6.30 p.m. A.S.E.E. Oxford Branch. "Fluorescent Lighting Maintenance, Colour Changing and Dimming," by H. Hewitt.

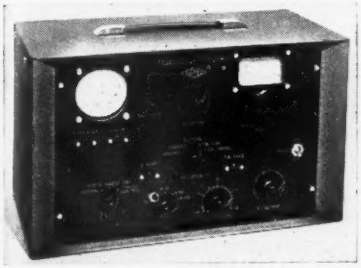
I.E.E. Scottish Dinner

The annual dinner of the Scottish Centre of the Institution of Electrical Engineers will be held on 4th March at the Caledonian Hotel, Princes Street, Edinburgh. Mr. J. Stuart, M.P., Secretary of State for Scotland, will propose the health of the Institution and Mr. J. Eccles, the president, will respond. Applications for tickets (18s 6d each for members and their guests and 12s 6d each for students and graduates) should be made by 25th February to Mr. J. H. P. de Villiers, c/o Bruce Peebles & Co., Ltd., 19, Waterloo Street, Glasgow, C.2.

NEW ELECTRICAL EQUIPMENT

Versatile Television Tester

The "Televet" which has recently been put on the market by AIRMEC, LTD., High Wycombe, Bucks, is a compact instrument providing every facility needed for completely checking, repairing, overhauling and aligning television receivers operating in Bands I and III. It incorporates a "wobbulator," pattern generator, a.m.



Airmec "Televet"

signal generator, l.f. oscillator, oscilloscope, e.h.t. voltmeter and a.c. and d.c. valve voltmeter. In spite of its versatility, however, the instrument has been so designed that it is straightforward in operation and both simple and quick to use. The overall dimensions are 15½in long by 9½in deep by 8½in high and the power requirements are about 80 W at 200/250 V a.c.

Ceramic Capacitors

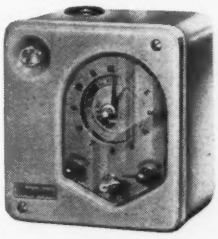
A new range of inexpensive ceramic capacitors, known as "Cascaps," has been introduced by the PLESSEY CO., LTD., Ilford, Essex. The material used is of the barium titanate type, having high permittivity and dielectric strength, enabling miniature capacitors to be produced, for operating at high voltages over a wide temperature range and for use in applications where precision of capacitance is not of primary importance. There are two basic types, one for purposes such as r.f. decoupling and the other for radio interference suppressors. By varying the composition of the ceramic, the capacitors can be made suitable for many diverse applications. The normal types are made with capacitances from 0·0005 to 0·01 μF, 500 V d.c. or 300 V a.c. working with a breakdown voltage of 4,000 V d.c. and an insulation resistance of 10^{11} ohms. With these characteristics, a 0·005 μF capacitor has a diameter of 0·664in and is 0·187in thick. Since the capacitors in radio interference suppressors rated at 230 V a.c. Class Y are required by B.S. 613 to have a breakdown voltage of 2,760 V a.c. or d.c., a special range of "Cascaps" has been developed with capacitances of 0·0005, 0·005 and 0·01 μF, to meet the requirements of Class X and of 0·0005 and 0·005 μF for Class Y. These are little larger than the normal "Cascaps," the diameter and thickness of a 0·005 μF Class Y capacitor being 0·898in and 0·135in respectively.

Sound-Film Projector

It is announced by the BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, London, W.C.2, that after many months of operating experience with prototype equipments their 16 mm sound-film projector, model 451, is now in full production. The new machine has facilities for making magnetic recordings on striped 16 mm film as well as for reproducing from magnetic and optical sound tracks. The projector, selling at £350, was illustrated in the *Electrical Review* of 9th April, 1954 (p. 629).

Cooker Timing Control Unit

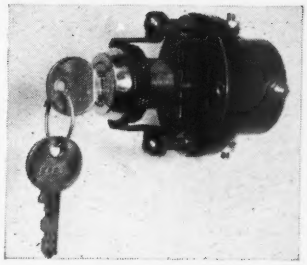
An a.c. cooker timing control unit has just been brought out by the SIMPLEX ELECTRIC CO., LTD., Broadwell, Oldbury, Birmingham. With this unit it is not necessary to scrap the existing control unit as the timer works in conjunction with it. It is also unnecessary for the timer to be attached to the original control unit, but this arrangement is often preferred and an adaptor plate can be supplied which allows of neat fixing to any cooker control unit conforming to B.S. 1833. The timer has three control knobs, one for setting the cooking time, another for setting the finishing time, and a rotary switch with "set," "timer on," "timer off" and "manual" positions. The timer is housed in an attractive enamelled steel casing complete with a neon indicator lamp and costs £6 9s 6d.



Simplex cooker timing control unit

Key Operated Switches

A barrel type key operated mechanism can now be fitted to any unit in the range of rotary switches made by CRATER PRODUCTS, LTD., The Lye, St. Johns, Woking, Surrey. A large number of different key sequences are available and keys can be made to withdraw or not in various positions as desired. All normal switch sequences and many special sequences are available with this type of operation whether for a.c. or d.c.



Crater key operated switch

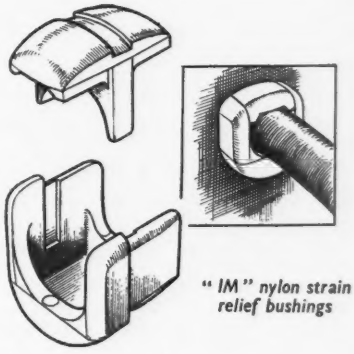
Insulated Wires and Sleevings

Diolpated p.v.c. is the basis of "Permanoid" Grade VO insulated wires, flexibles and sleevings made by ASSOCIATED TECHNICAL MANUFACTURERS, LTD., Vincent Works, New Islington, Manchester, 4. These retain their full flexibility and freedom from embrittlement over the range −35 deg C to +150 deg C. The flexibility of these insulated wires and sleevings remains unaffected after varnish impregnation at temperatures up to 150 deg C. The new polymeric diolpate plasticizer is not leached out with this drastic treatment. Similarly, diolpate prevents the possibility of age hardening and at the same time, being a plasticizer of the non-migratory type, it makes p.v.c. sheaths safe to use in conjunction with polythene insulated cores. In addition diolpated p.v.c. has an increased tensile strength.

Strain Relief Bushings

The exclusive manufacturing rights for the United Kingdom, the Continent and sterling areas of American "Heyco" nylon strain relief bushings have been granted to INJECTION MOULDERS, LTD., Westmoreland Road, London, N.W.9, who are making them under the name of "IM" bushings.

These nylon bushings are fully approved by American underwriters' laboratories and the Canadian Standards Association. The bushings are easily snapped into the wiring hole in a single operation and impart a positive non-slip insulating grip. Cable wear at the entrance to the product is thereby eliminated.



"IM" nylon strain relief bushings

GENERATION AND DEVELOPMENT

Ash Sluicing Opposed

It is expected that Northumberland County Council and the Town Councils of Blyth, Tynemouth, Whitley Bay, Sunderland and South Shields will oppose the Bill being promoted in Parliament by the British Electricity Authority relating to the construction of a new power station between Blyth and Bedlington (Northumberland). The Councils are all opposed to the method of disposing of ash from the plant. The British Electricity Authority, it is stated, did not consult local authorities in the area before deciding to sluice ash from the new plant by means of a pipe-line into the sea at Blyth. When the plant is in full operation, about 500,000 tons of ash will be disposed of annually in this manner, and the Councils are of the opinion that some of this ash may be washed up on to their beaches. If the opposition by the Councils is successful, it is likely that the usual method of dumping ash into the sea from barges will have to be adopted.

Boiler Plant Contract Commitments

The British Electricity Authority has entered into commitments to place the following contracts for boilers and condensing and feed heating plants associatetd with 60 MW turbo-alternators for new power stations in the construction programmes for 1959, 1960 and 1961:—

Power Station	Rating	For Commissioning in 1959	1960	1961
Boilers	lb/hr			
Foster Wheeler, Ltd.:—				
Aberthaw	3 × 755,000	1	1	1
Mitchell Engineering, Ltd.:—				
Portishead...	4 × 300,000	2	2	—
Skelton Grange	4 × 550,000	1	2	1
Uskmouth "B"	4 × 550,000	1	1	2
John Brown Land Boilers, Ltd.:—				
Belvedere	6 × 550,000	2	2	2
Elland	2 × 550,000	1	1	—
Condensing and Feed Heating Plants				
Vickers-Armstrongs, Ltd.:—				
Elland		1	1	—
Uskmouth "B"		1	1	2
Belvedere		2	2	2
Marchwood		1	2	—

Argyll Water Power Scheme

The Loch Glashan Hydro-Electric Scheme (Constructional Scheme No. 71) of the North of Scotland Hydro-Electric Board, announced last week, will produce 17·6 million kWh annually. Loch Glashan lies north-east of Lochgilphead in Argyllshire. The natural catchment area of the loch is four square miles; the rainfall on a further 20½ square miles of catchment will be utilized by diversion aqueducts.

All the water will be collected behind a dam, 1,100ft long and 45ft high, to be built at the outlet of Loch Glashan. From the dam water will be led by a tunnel and pipeline 5,500ft long to a power station with a capacity of 4,200 kW situated on the shores of Loch Gair. The turbo alternator, which will operate under a head of 356ft, will discharge into Loch Gair.

The Loch Glashan scheme is required to help meet the rapidly growing demand for electricity in the Kintyre and Knapdale areas. It will meet this growth of load for a time but consideration is already being given to further reinforcement which may be in the form of an extension of the Highland grid from the Shira scheme, near Inveraray, to Kintyre.

Rewiring Council Houses

Battersea Housing Committee has been informed that in the next few years it will be necessary to renew the whole of the wiring in houses on the Latchmere estate. As a start the Committee proposes that rewiring work should be put in hand where it is most urgently needed and an estimate of £5,000 has been formally submitted.

New Swedish Hydro-Electric Plant

The Krangede Power Co. has recently inaugurated a new hydro-electric station on the Faxe River in North East Sweden. It has a total capacity of 100,000 kW and the annual production will be approximately 500 million kWh. The dam forming part of the station is 1,200 m long.

Dam to Increase Loch Storage

The North of Scotland Hydro-Electric Board has placed a contract for the construction of a dam at Loch Fannich, Ross-shire, with John Laing & Son, Ltd. The Fannich scheme, part of the hydro-electric development of the River Conon Valley, came into operation in 1950. Water is taken by tunnel and pipeline from Loch Fannich to a 24 MW power station at Grudie Bridge. The Loch Fannich dam will be a rock-filled structure, 2,400ft long and 30ft high with a central section of mass concrete gravity dam. It will raise the water level of the loch by about 20ft and will increase the water storage for the power stations at Grudie Bridge, Luichart and Torr Achilty and raise the annual output of the Fannich scheme by 3 million kWh to a total of 82 million kWh. Work on the dam will be started in the spring and the stone for its construction will be quarried near the site. The civil engineering consultants are Sir Alexander Gibb & Partners.

Tummel Valley Extensions

The North of Scotland Hydro-Electric Board has published its Tummel Valley Additions Scheme (Constructional Scheme No. 31). This will add about 32·7 million kWh annually to the output of the existing schemes on the Rivers Tummel and Garry in Perthshire which have an estimated average annual output of 600 million kWh.

The scheme provides for the construction of two new power stations with a total capacity of 3,900 kW, one on the shores of Loch Ericht in Perthshire and the other on a tributary of the River Truim near Dalwhinnie, Inverness-shire. The scheme also includes the diversion of several burns to the Board's reservoirs. The yearly output from these diversions will total nearly 10 million kWh. The three-mile aqueduct which leads water from Dunalastair reservoir to the Tummel Bridge power station will be enlarged and the water level raised, increasing the output of the station

Too Many Supply Failures

Thingoe Rural District Council recently decided to make a strong protest to the Eastern Electricity Board against the number of supply interruptions. Mr. N. R. Whitwell said that in his district and the surrounding area there was a breakdown on Christmas Day, when those dependent on electricity for cooking had to be content with cold dinner, and other breakdowns had occurred on 2nd, 6th, 16th, 26th, 27th and 28th January. In addition, there was an interruption from 1 to 4 p.m. on 20th January for maintenance purposes of which the Board had given notice.

Stage Lighting in Schools

Lancashire County Council proposes to provide stage lighting equipment in thirteen schools.

British Columbia Hydro-Electric Project

The British Columbia Electric Co., Ltd., has applied for a water rights licence to develop hydro-electric power at a new site 14 miles north of Squamish, on the route of the company's main transmission line from its Bridge River plants to Vancouver. The new development, when completed, will increase the company's power supply by nearly 200,000 h.p. It is estimated to cost $25 million.

Power Resources of Newfoundland

Official estimates of Newfoundland's power resources indicate a potential, at ordinary minimum flow, of almost 1,000,000 h.p. At the end of last year, turbine installations totalled 306,100 h.p. or less than one-third of this potential.

Honduras Development

A special committee which has been considering a plan for the economic development of Honduras has now submitted its recommendations to the

President of the Republic. The plan, which has been drawn up with the assistance of the International Bank for Reconstruction and Development, envisages the expenditure of about 300 million lempiras (approximately £54 million) over the next five years on a number of projects, including hydro-electric development.

From studies of the country's resources of hydro-electric power, the report concludes that the most convenient site for a plant, with an initial capacity of 15 MW and eventual capacity of perhaps 100 MW, would be the River Lindo to the north of Lake Yojoa.

The committee recommends the setting up as soon as possible of a National Electricity Company to organize and administer this hydro-electric plant, and all other public service plants in the country, the production and wholesale distribution of the power from these plants by the high voltage grid, and the retail sale of the power distributed over the rural grid system.

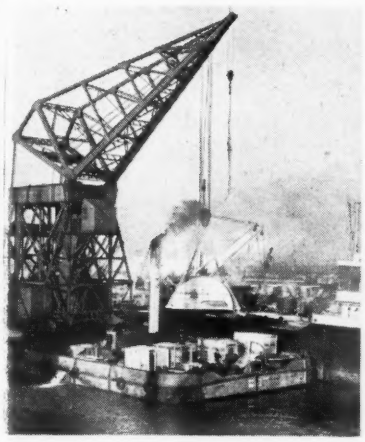
Turkish Fuel and Power Output

Part of the programme already partly fulfilled last year for expanding coal output in the Zonguldak coal basin is expected to bring the annual output up to 7,000,000 metric tons in 1957. By that year output of lignite is expected to reach nearly 2,700,000 tons. With the completion of four large and eleven medium-sized hydro-electric stations and a number of thermal stations at present under construction the annual electricity output of Turkey will reach 2,644 million kWh. At present the output is 1,450 million kWh; between 1956 and 1958 this figure is expected to increase to 3,000 million kWh.

Water Wheel Alternator for Norway

The accompanying picture shows the top half of the stator of a 370 ton water wheel alternator for the Aura power station of the Norwegian State Power Co. being loaded on to the s.s. *Atle Jarl* by the floating crane at Alexandra Dock, Hull. The alternator was built by the General Electric Co., Ltd., and will provide power for an aluminium plant. It has an output of 62·5 MVA at 12·3 kV, and runs at a speed of 428·6 r.p.m. To minimize transport difficulties the complete machine was designed so that it could be dispatched in sections not exceeding 60 tons in weight.

Part of G.E.C. stator for Norway being loaded on board ship at Hull



Atomic Power in Canada

Canadian power companies have been invited to submit proposals on the construction of experimental atomic power plants. The Minister of Trade and Commerce, Mr. C. D. Howe, said that development of atomic power plants in Canada would be similar to the plan announced in Washington by the U.S. Atomic Energy Commission, under which help would be given in the building of private experimental atomic power plants.

Rhodesian Water Power

The latest step in the series of studies of water power in Rhodesia is the calling-in by the Federal Government of a British firm of accountants to report on estimates of construction costs of the Kafue (N. Rhodesia) and the Kariba (S. Rhodesia) projects. These estimates were recently prepared by French consultants who put the cost of the Kafue scheme at £55 million for an initial 75 MW and an ultimate 400 MW. They considered that the first power would be available by mid-1959, the kWh cost being 0·336d; the second-stage cost was estimated at 0·406d. The cost of the Kariba scheme was put at £86 million; the first stage, to be ready by mid-1961 would develop 140 MW (0·286d/kWh) and the second stage 740 MW (0·254d/kWh). The respective peak load possibilities of the two schemes were given as 400 MW and 1,000 MW.

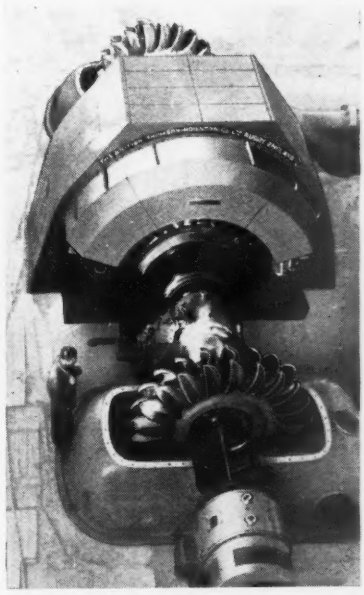
B.T.H. Plant in Spanish Station

The first of two 36,000 kVA, 600 r.p.m., 11 kV generators supplied by the British Thomson-Houston Co., Ltd., for the Artias power station of the Sociedad Productora de Fuerzas Motrices, S.A. Spain, was commissioned in December. The second generator is in an advanced stage of erection and should be commissioned during next month.

The generators are each driven by two single jet Pelton turbines supplied by a French concern, one wheel being overhung from each end of the generator shaft. These turbines operate under a head of 2,600ft, and the grandeur of the surrounding country can be appreciated when it is realized that the intake to the pipeline is situated at a low point in the watershed from which the turbines are supplied.

The station is situated close to the Franco-Spanish border, 3,700ft above sea level, and the machines had to be transported to site partly over the French railways and partly by road; the former limited the size of the cases and the latter the weight. To meet these limitations an interesting mechanical design of motor was adopted. This involved the use of a pre-stressed hollow forging, to which stub-shafts were bolted. The ten poles were each carried on the central forging by four dovetails, thus it was possible for the complete rotor to be dismantled for shipment. Even so the central forging was only just below the transport weight limitation of 40 tons.

A general view of Artias power station, Spain, and (below) the first 36,000 kVA generator supplied by the B.T.H. Co. being erected in the station



Financial Section

STOCKS and SHARES

THE industrial markets of the Stock Exchange have naturally been tending to move in accordance with the turn of events in the Formosa area. Quotations were inclined to be irregular in places, but some good gains were established in shares concerned with the big new projects for the development of the British railways and the roads. Continued weakness in gilt-edged stocks remained a drag on prices in other markets. Last week saw the disappearance, from the Stock Exchange lists, of Siemens Bros. ordinary shares, practically all of which are now held by A.E.I.

Railway Plans

At £5, Westinghouse Brake & Signal ordinary shares retain the 17s 6d rise which, in the course of no more than a month, anticipated and followed news of the £1,200 million railway modernization plans. Among the other shares singled out for particular attention in this same connection, English Electrics again advanced strongly, reaching 68s 6d before coming back part of the way to 67s 6d. Recent activity in J. Lucas shares was attributed to the same cause, which also kept interest stirring in the group of cable manufacturers' shares. Here, B.I.C.C. were again very well supported, while Johnson and Phillips were marked up a further 4s 6d and several of the others went 1s or so better.

Results to Come

February usually produces in the electrical equipment group the first of the important dividend and profits statements on account of the year past. So far as dividends are concerned, the occasion has been robbed this time of some of its interest by the action of both English Electric and A.E.I. in declaring their intentions ahead of the usual dates. They did so in connection with their negotiations for the acquisition of interests in, respectively, Vulcan Foundry and Siemens Bros. As a commentary on the firmness of investment confidence in front-rank industrial shares, it is interesting to note that, although the 12½ per cent total foretold by English Electric, and the 14 per cent payment to come from A.E.I. (both representing material improvement on the previous rates), the yield on the shares is, nevertheless, in each case under 4 per cent at ruling prices. It is also, incidentally, a good deal less than the current return from War Loan.

Price Changes

S. Smith 4s shares, which gave one of last year's best market performances, came into renewed favour, rising 2s 3d and reaching the £1 mark for the first time in their present form. Metal industries repeated the previous week's advance of a florin. Babcocks was as much as 7s 6d to the good, and R. A. Listers added a further halfcrown on further consideration of the latest

Week's Price Changes

Company or Board	Nom. Value	Middle price 7th Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	90⅛	—2	3	3	3 6 4	97	88⅞
Brit. Elec. 1974/77	100	91⅛		3	3	3 5 6	96⅛	87⅛
Brit. Elec 1976/79	100	96⅛		3⅛	3⅛	3 12 5	101⅛	93 3/16
Brit. Elec. 1974/79	100	106½	—1	4⅛	4⅛	3 19 10	111⅛	103 3/16
Overseas Electric Supply								
Calcutta Elec.	£1	21 6		6†	6†	5 11 6†	24/6	18/7
East African Power	£1	22/6		7	7	6 4 6	23/4	19/6
Nigerian Elec.	£1	25/6	+2/-	10	10	7 17 0	25/-	23/6
Palestine Elec. "A"	£1	22/-		Nil	Nil	—	21/-	16/-
Perak Hydro-Elec.	£1	19/-	—6d	6	10	10 10 6	20/-	13/9
Equipment and Manufacturing								
Aberdare Cables	5/-	13/3		25	12½*	4 14 3	14/3	8/1
Aerialite	1/-	6/3	+3d	88⅛	88⅛	7 1 6	14/6	10/9
Allen, W. H.	£1	79/6		15	20	5 0 8	78/6	50/-
Aron Elec. Ord.	£1	56/6		20	15	5 6 4	60/-	43/-
Assoc. Elec. Ord.	£1	71/3	+1/3	20	11¼*	—	62/6	41/6
Automatic Tel. & El.	£1	75/-	+1/3	15	15	—	73/-	57/3
Babcock & Wilcox	£1	78/-	+4/6	18	12*	3 1 6	76/3	47/3
Baldwin, H. J.	2/-	4/9		20	20	8 8 6	5/6	3/9
Bakelite	10/-	29/9	+6d	12½	12½	4 4 0	32/-	23/6
British Aluminium	£1	43/6	+9d	12	10	4 12 0	41/-	33/9
B.I. Callender's	£1	55/-	+1/9	10	10	3 12 9	52/-	37/9
B I. Callender's 6% Pref.	£1	25/6	—6d	6	6	4 14 0	26/6	24/3
British Thermostat	5/-	26/3		35	27½*	—	28/-	12/-
British Vac. Cleaner	5/-	16/9	—6d	15	25	7 9 3	14/6	11/6
Brook Motors	10/-	42/-	—6d	20	20*	—	45/6	29/3
Brush Ord.	5/-	9/6	+6d	4	6	3 3 2	8/3	3/6
Bulgin, A. F.	1/-	5/3	+3d	30	30	5 14 3	4/3	3/2
Burco	5/-	22/6	+6d	35	25*	5 11 0	21/6	12/1
Chloride El. Storage "A"	£1	68/6		20	12½*	3 13 0	68/6	46/6
Clarke Chapman	£1	74/6		17½	20	—	73/-	47/6
Cole, E. K.	5/-	23/9	—3d	25	27½	2 18 0*	20/-	11/6
Cossor, A. C.	5/-	10/9	—3d	10	10	4 13 0	11/-	7/-
Crabtree	10/-	32/6	+6d	17½	20	6 3 1	32/-	23/9
Crompton Parkinson Ord.	5/-	19/3	+9d	20	20	—	17/9	11/6
De La Rue	5/-	23/9	+1/3	Nil	20	4 4 2	24/-	12/3
Decca	4/-	56/6	+1/6	35	56¼*	3 19 9	56/6	32/-
Desoutter	5/-	26/3		18	20	3 16 4	26/6	16/1
Dewhurst	2/-	8/-		19	24	6 0 0	7/6	5/1
Dictograph Tel.	2/-	7/3		20	20	5 10 4	8/-	5/2
Dubilier Condenser	1/-	5/3	+3d	25	25	—	5/3	3/3
E.M.I.	10/-	29/3	+1/9	8	10	3 8 6	27/9	11/3
Electrical Components	5/-	17/3		20	20	5 16 0	16/3	10/9
Elec. Construction	£1	37/-	+9d	15	15	4 1 0*	35/-	26/6
Enfield Cable Ord.	£1	23/9	+1/3	5	Nil	Nil	26/3	16/6
English Electric	£1	67/6	+3/9	15	10*	—	59/-	38/-
English Electric 3¾% Pref.	£1	16/-	—6d	3¾	3¾	4 13 9	16/9	15/3
Ericsson Tel.	5/-	35/6		22†	25†	1 15 3†*	33/9	22/9
Ever Ready	5/-	24/6		35	40	—	26/3	17/9
Falk Stadelmann	£1	50/-		15	15	6 0 0	49/-	36/6
G.E.C. Ord.	£1	60/-		11½	12½	4 3 4	60/-	37/6
G.E.C. 6½% Pref	£1	27/6	—1/3	6½	6½	4 14 6	28/9	26/6
General Cables	5/-	16/9		30	30	8 19 0	18/-	16/3
Greenwood & Batley	£1	55/-		17½	17½	6 7 3	55/-	40/3
Hackbridge Cable	5/-	15/9		20	20	6 7 0	15/9	11/3
Hackbridge & Hewittic	5/-	27/6	+2/6	20	25	4 15 3	25/-	16/10
Hall Tel. Acc.	10/-	12/-		10	10	8 6 8	13/-	10/6
Heatrae	2/-	5/6		12½	12½	4 11 0	5/6	4/-
Henley's	10/-	20/6	+1/-	10½	10½	5 2 6	22/-	15/6
Holophane	5/-	19/6	+2/3	20	25	6 8 3	18/-	13/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

annual results. Improvements of between two and three shillings occurred in Reyrolles, Sturtevant and Holophane. Other shares to show marked improvement included De la Rue, Brush and Hackbridge & Hewittic.

Radio Activity

Electronics being these days a word to conjure with in investment circles, the 10s shares of Electric and Musical Industries started a fresh advance after the company's announcement concerning the newly named E.M.I. Electronics company, and the plans for a large and general expansion of the group's activities in this field. At 29s 3d (after changing hands over 30s) the price of the shares showed an improvement of 1s 9d on the week, and the yield on last year's dividend counteracted to less than 3½ per cent. Decca 4s shares, after seeming for a time to be affected by selling of "rights" to the new issue of shares, returned to form with a recovery of 1s 6d to 56s 6d.

in Electrical Investments

Company or Board	Nom. Value	Middle price 7th Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1954 Highest	1954 Lowest
Equipment and Manufacturing—continued.								
Hoover	5/-	48/3	—6d	25	45	4 13 3	51/-	26/3
I.C.I.	£1	44/6	—3d	13	15	3 7 6*	43/6	26/6
Intl. Combustion	5/-	30/-	—6d	15	20	3 6 8	30/-	14/6
Johnson & Phillips	£1	51/6	+4/6	15	15	5 16 6	52/6	45/6
Lancashire Dynamo	£1	58/9	+6d	12½	14	4 15 3	59/6	43/-
Laurence, Scott	5/-	15/9		15	20	3 3 6*	14/9	7/-
Lister, R. A.	£1	37/6	+2/6	12	9·3	4 19 3	33/-	22/6
London Elec. Wire	£1	56/3	+2/3	15	10*	3 11 0	54/-	38/-
Lucas, J.	£1	49/6	—6d	10·8	7½*	3 0 6	49/-	25/3
Marryat & Scott	2/-	9/9		22½	25	5 2 6	9/6	5/11
Mather & Platt	£1	59/-	+1/6	12½	15	—	53/-	32/-
Metal Industries	£1	38/-	+2/-	12	9	4 14 9	42/3	29/6
Midland Elec. Mfg.	£1	45/-		15	15	—	43/9	31/6
Morphy-Richards	4/-	30/-		40	35*	4 13 4	27/6	11/4
Murex	£1	53/6		15	15	5 12 3	57/-	49/-
Newman Ind.	2/-	3/-		10	10	6 13 4	2/6	2/-
Oldham & Son	1/-	3/3		17½	17½	5 7 9	3/4	2/5
Parnall (Yate)	5/-	12/6		6	8	3 4 0	11/-	4/3
Parsons, C. A.	£1	67/6		12½*	7½*	2 4 6	60/-	38/1
Plessey	10/-	75/-	+3/9	30	20*	2 13 4	64/-	37/10
Pye Deferred	5/-	39/9		20	20*	2 10 3	37/-	15/7
Revo	10/-	14/6		27½	9*	6 4 2	20/3	14/-
Reyrolle	£1	5½	+2/6	12½	13¾	2 13 9	92/6	66/-
Rheostatic	4/-	16/6	+1/-	19	20	4 17 0	15/9	11/-
Richardsons Westgarth	5/-	14/6	+6d	15	15*	5 3 5	12/3	6/6
Scottish Cables	4/-	22/3	+1/3	20	27½	4 18 9	21/9	12/1
Smith (England), S.	4/-	20/-	+2/3	15	17½*	3 10 0	17/6	7/8
Southern Areas	£1	34/3		6	7½	4 7 6	32/6	17/6
Strand Elec.	5/-	9/9		17½	17½	8 19 6	10/3	8/3
Sturtevant	5/-	24/6	+3/-	18·1†	18·9*†	—	22/9	14/6
Sun. Elec.	£1	33/9		15	15	8 17 9	33/9	27/6
Switchgear & Cowans	5/-	13/6		22½	10	3 14 0	13/7	9/9
Taylor Tunnicliff	5/-	13/3	+3d	25	12½*	4 14 3	12/4	10/7
T.C.C.	10/-	43/3		20	30*	—	41/3	21/3
T.C. & M.	£1	40/-	+1/3	10	8½*	4 5 0	37/6	30/3
Telephone Mfg.	5/-	10/3		10	10	4 17 6	9/6	7/6
Thorn Elec.	5/-	36/3	+1/3	12½	20	2 15 3	30/6	13/3
Thornycroft	£1	41/3	+1/3	15	15	—	39/6	26/6
Tube Investments	£1	82/6	—2/6	15	17½	4 4 9	81/3	60/3
Vactric	5/-	36/3	+5/6	Nil	10	1 8 9	24/6	7/6
Veritys	5/-	9/-		10	12½	6 19 0	10/6	5/-
Walsall Conduits	4/-	52/6		70	70	5 6 8	52/6	44/-
Ward & Goldstone	5/-	42/9	+3d	45	50	—	43/6	21/-
Watford	2/-	7/-		25	22½*	—	7/3	4/7
Westinghouse Brake	£1	£5		16	18	3 12 0	86/3	60/9
West, Allen	5/-	22/6	+1/-	15	17½	3 17 9	19/6	12/7
Wolf Electric	5/-	18/6	+1/6	15	17½	4 14 7	17/6	11/-
Trusts, Transport and Communications								
Anglo-Am Tel.:								
A Ord.	100	83		6	6	7 4 6	89½	80
Ord.	100	52½		3¾	3¾	7 2 10	55½	52
Anglo-Portuguese	£1	24/-	—9d	8	8	6 13 4	25/9	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	24/-		35	50	—	24/-	13/-
Cable & Wireless:								
Ord.	£1	47/-	—1/6	9	10*	4 5 0	42/9	26/2
4% Loan	100	99½		4	—	4 0 5	98½	95½
Calcutta Trams	£1	21/-		2½†	6†	5 14 3†	24/6	17/1
Cape Elec. Trams	£1	17/-		5½	7	8 4 9	17/6	12/4
Marconi Marine	£1	35/-	+6d	10	10	5 14 3	35/-	27/6
Oriental Tel. Ord.	£1	99/-		16	16	—	101/3	82/6
Telephone Props.	£1	90/-		—	—	—	92/6	74/6
Telephone Rentals	5/-	11/3		10	10	4 9 0	11/-	9/-

Clarke Chapman

Clarke Chapman & Co. generally have their results out before the end of February. The rate of the single annual dividend distribution has been raised by 2½ per cent on three of the four latest occasions. Last year's payment of 20 per cent (which was covered more than four times over by the earnings of 1953) was followed by a scrip issue, and would be equivalent to 13⅓ per cent on the capital of £720,000 now ranking. Clarke Chapman shares at the official quotation of 74s 6d (with recent dealings around 77s) stand almost on a level with the quotation ruling a year ago, despite the fact that shareholders have received in the interval one share free, for every two then held.

Taylor Tunnicliff

Recent activity in the 5s ordinary shares of Taylor Tunnicliff (Electrical Industries) took the price up from 11s 3d to 13s 3d in advance of the annual dividend declaration. The rise was apparently assisted by the inclusion of the shares among market recommendations connected with railway development, with particular reference to demands for the insulators and porcelains in which the company is stated to specialize. It is the company's practice to make a single distribution each year on the ordinary stock, which now amounts to £600,000 after being doubled by a scrip issue two years ago.

British Electricity Stocks

The extent to which gilt-edged market conditions have been changed by the increase in money rates can be measured by the difference of 4 to 5 points between current prices of the four British Electricity stocks, and their best quotations of last year. A present buyer of the 4½ per cent stock, redeemable between 1974-79, and quoted now around 106½, secures a current yield of almost a full 4 per cent on his money; allowing for the capital loss of the 6½ points on eventual repayment at par, the "redemption yield" is still a little over 3¾ per cent. On the 3½ per cent stock 1976-79, quoted at 96½, the running yield is 3⅝ per cent, but the repayment profit of 3 points brings the redemption yield to much the same mark. On the two 3 per cent stocks, the flat yields are about 3¼ per cent, with 3⅜ per cent to redemption.

REPORTS and DIVIDENDS

R. B. Pullin & Co., Ltd.—The accounts for the year to 30th September last now published show a group trading profit of £141,315, as compared with £98,381 for the preceding year, and after providing for taxation, the net balance is £65,542 (against £29,397), to which is added £17,616 brought in, making £83,158. Allocations to various reserves total £56,733, and as we have already reported, the dividened for the year is maintained at 15 per cent. The balance carried forward is £8,850.

British Relay Wireless & Television, Ltd., is to raise upwards of £500,000 for its expansion programme and will make a rights issue in a few months' time. Meanwhile the authorized capital is to be increased from £475,000 to £750,000 by the creation of "A" ordinary 5s shares. The board states that the immediate reason for this increase is that opportunities may occur of extending the company's operations by the acquisition of existing businesses for considerations which may, in part at least, consist of shares in the company.

Electrical Components, Ltd., has declared an interim dividend of 7½ per cent on the ordinary shares (unchanged).

The Coventry Gauge & Tool Co., Ltd., is to make an issue of 400,000 new 10s ordinary shares to existing holders on a basis of one-for-three, at 13s per share.

New Companies

Oryx Electrical Laboratories, Ltd.—Registered 29th January. Capital £100. Designers, manufacturers of and dealers in scientific, surgical, optical, mechanical and heating and lighting instruments of all kinds, etc. Directors: C. S. R. Wotton and Vera Wotton. Regd. office: 24, Basinghall Street, E.C.2.

Electricold Refrigeration Co. (Lewes), Ltd.—Registered 28th January. Capital £500. Refrigeration engineers, electrical and electronic engineers, etc. Directors: J. R. Bailey and Mrs. Gladys E. Bailey. Regd. office: 83, Valence Road, Lewes.

Pyrad Electric, Ltd. — Registered 28th January. Capital £100. Heating, ventilating, air conditioning, refrigerating, sanitary, constructional, mechanical, electrical and general engineers, etc. The first directors are to be appointed by the subscribers. Solicitors: Slaughter & May, 18, Austin Friars, E.C.

S. Barratt & Co. (Manchester), Ltd.—Registered 21st January. Capital £1,500. To enter into an agreement with Stephen Barratt for the acquisition of the business carried on by him; and to carry on the business of electricians, mechanical engineers and manufacturers, workers and dealers in electrical apparatus, etc. Directors: S. Barratt and F. Nugent. Regd. office: 300, Ashton New Road, Beswick, Manchester.

A. Geall, Ltd.—Registered 21st January. Capital £5,000. To acquire all goodwill, plant and stock in trade of the business of electrical engineers carried on by Colin C. Hyams as "A. Geall," at 26, George Street, Hove. Directors: C. C. Hyams, Mrs. Elizabeth Hyams and C. R. Gerrard. Solicitors: Bunker & Co., 9, The Drive, Hove.

Trojan Electric Co., Ltd.—Registered 24th January. Capital £25,000. To acquire such of the assets of the Trojan Electric Co., of Moss Side, Manchester and Altrincham, as may be deemed expedient, and to carry on the business of sellers on hire purchase or otherwise of radio and television sets, etc. Directors: H. G. Jenkinson, A. Mullock and N. C. Sunderland (directors of Trojan (Radioelectric), Ltd.). Regd. office: 10-12, Alexandra Road, Moss Side, Manchester, 16.

T. Farrimond, Ltd.—Registered 26th January. Capital £1,000. Constructors and maintainers of and dealers in radio and television apparatus, etc. Directors: T. Farrimond and R. Tillman. Regd. office: 1, Wood Street, Bolton.

Tricity Finance Corporation, Ltd.—Registered 31st January. Capital £50,000. Capitalists, financiers, etc. Directors: R. E. Davis, A. Deutsch (directors of Thorn Electrical Industries, Ltd., etc.). Regd. office, 105, Judd Street, W.C.1.

Stratit, Ltd.—Registered 18th January. Capital £100. Manufacturers and repairers of and dealers in electrical heating elements, dynamos, motors, armatures, magnetos, batteries, etc. The first directors are not named. Secretary: E. W. Young, 50, Gresham Street, E.C.2.

Increases of Capital

Thompson, Diamond & Butcher, Ltd.—Increased by £50,000, in 1s ordinary shares, beyond the registered capital of £85,000.

British Electric Traction Co., Ltd.—Increased by £4,929,874, in 5s "A" deferred ordinary shares, beyond the registered capital of £4,579,903.

Royce Electric Furnaces, Ltd.—Increased by £20,000, in £1 ordinary shares, beyond the registered capital of £10,000.

Liquidations

A. W. Lines, Ltd., electrical dealers.—Last day for receiving proofs for dividend 21st February. Liquidator, Mr. A. W. Hunter, 418-422, Strand, London, W.C.2.

L. Goodman (Radio), Ltd. (In voluntary liquidation). — Members' meeting on 25th February at 10, Beauchamp Place, London, S.W.3, to receive an account of the winding-up by the liquidator, Mr. M. H. Bradbury.

D. R. Weir (Ewell), Ltd., radio and electrical engineers.—Liquidator, Mr. N. W. Osborne, 11-12, Finsbury Square, London, E.C.2, appointed 25th January with a committee of inspection.

Whittaker Electrical Products, Ltd.—Meetings 14th March at 57, Blandford Street, London, W.1, to receive an account of the winding-up by the liquidator, Mr. E. Benjamin.

Bankruptcies

J. H. Thompson and **H. A. Why,** lately carrying on business in copartnership under the style of Southern Radio, T.V. Electrical Services, at 52, Wellington Mews, Hastings, electricians.—Trustee, Mr. E. C. Sherwood, 8, Old Steine, Brighton, Official Receiver, released 2nd February.

H. Turner, 20, Battersea Rise, Clapham Common, London, radio and electrical contractor.—Last day for receiving proofs for dividend 18th February. Trustee, Mr. C. T. Newman, 58-61, York Terrace, Regent's Park, London, N.W.1, Official Receiver.

Australian Electrical Trade

In Australia's imports of dynamo-electric machinery and electrical appliances and equipment during the nine months ended March, 1954, there was a small decline compared with the corresponding period of 1952-53, the respective total values being £A18,867,000 and £A20,153,000. The accompanying statement compares the values of the main groups in the two nine-monthly periods. The outstanding decline was in cable and wire.

Class of Goods	9 months ended March 1954 £A(000)	Inc. or dec. on 9 months ended March 1953 £A(000)
Batteries and accumulators	288	+ 21
Cable and wire, covered ...	1,512	− 1,238
Communication equipment, including radio	1,843	− 401
Dynamo-electric machines...	5,020	+ 145
Heating and cooking appliances	344	+ 139
Lamps, filament	877	+ 656
Protective equipment ...	386	− 207
Regulating, starting and controlling apparatus ...	3,166	− 704
Sparking plugs	391	+ 167
Transformers and rectifiers	3,024	− 199
Other electrical machinery and appliances	2,016	+ 605

During the same period Australian exports of dynamo-electric machinery and electrical appliances totalled £A1,421,000 in value compared with £A1,244,000 during the corresponding period of 1953. The total for the first half of 1954 included batteries and accumulators £A287,000 (£A233,000) and communication equipment £A388,000 (£A370,000).

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 16th March from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1952

2382. Sylvania Electric Products, Inc.—Colour television system. 29th January, 1952. (726323.)

7104. Hotpoint Electric Appliance Co., Ltd.—Electric heaters. 9th March, 1953. (726184.)

7647. British Thomson-Houston Co., Ltd.—Pulse generating circuits. 23rd March, 1953. (726185.)

13023. General Electric Co., Ltd., and Tombs, N. C.—Preparation of ferrous powders suitable for the manufacture of permanent magnets. 27th April, 1953. (726264.)

1953

314. Cart, P.—Device for delaying the switching on of an electric energy consuming apparatus. 5th January, 1953. (726200.)

398. British Thomson-Houston Co., Ltd.—Electrical binding posts. 6th January, 1953. (726053.)

429. Philips Electrical Industries, Ltd.—Rotary electric machines of low power. 6th January, 1953. Addition to 676167. (726055.)

981. Parsons & Co., Ltd., C. A.—Dynamo-electric machines. 11th December, 1953. (726060.)

1894. Siemens-Schuckertwerke Akt.-Ges.—Dry rectifier arrangements. 22nd January, 1953. (726432). 5426. Processes for the production of selenium rectifiers. 26th February, 1953. (725961.)

1899. Felten & Guilleaume Carlswerk Akt.-Ges.—Extrusion press more particularly for cable sheathings. 22nd January, 1953. (725942.)

2013. Standard Telephones & Cables, Ltd.—Microwave coupling arrangements. 23rd January, 1953. (726067.)

2466. Automatic Electric Laboratories, Inc.—Pilot controlled gain regulator for communication circuits. 28th January, 1953. (725947.)

2578. Rainbows, Inc.—Electrical liquid heater. 29th January, 1953. (725949.)

2819. Adams, W. L.—Electric lamp fittings. 10th December, 1953. (726434.)

2929. Philco Corporation. — Electrode assembly for thermionic valves. 2nd February, 1953. (726210.)

3020. Goodrich Co., B. F.—Microporous battery separator and method of making same. 3rd February, 1953. (725950.)

3140. National Research Development Corporation.—Electrical plug and socket connectors. 4th February, 1953. (726213.)

3192. General Electric Co.—Cathode-ray tubes. 4th February, 1953. (726214.)

3275. British Thomson-Houston Co., Ltd.—Gain control in high-frequency electrical pulse receiving systems. 5th February, 1953. (726435.)

3417. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Electronic signal storage tubes. 6th February, 1953. (726677.)

3458. Bendix Aviation Corporation.—Ceramic transducers for underwater transmission and reception of sound. 6th February, 1953. Addition to 718260. (726330.)

4104. Standard Telephones & Cables, Ltd.—Method of producing selenium rectifiers. 13th February, 1953. (726221.)

4756. Telefunken Ges. für Drahtlose Telegraphie.—Electric discharge devices. 20th February, 1953. (726223.)

4836. British Dielectric Research, Ltd.—Construction of printed electric circuits. 19th February, 1954. (726083.)

5121. Schweizerische Lokomotiv- und Maschinenfabrik.—Control devices for the thermo-electric power plants of tractive vehicles. 24th February, 1953. (725959.)

5899. Dehn, S. G. (Thermactor Co.)—Electric heater for subterranean fluid reservoirs. 3rd March, 1953. (726891.)

6827. Philips Electrical Industries, Ltd.—Sealing off glass tubes, such as exhaust tubes of evacuated vessels. 12th March, 1953. (726097.)

7132. Automatic Telephone & Electric Co., Ltd.—Automatic switches for use in telephone or like systems. 9th December, 1953. (726447.)

7239. Radio Corporation of America.—Regulated power supply. 16th March, 1953. (725971.)

7284. Hoover, Ltd.—Electric motors. 17th March, 1953. (726102.)

7297. Chloride Electrical Storage Co., Ltd.—Lead acid electric accumulators. 5th February, 1954. (726234.)

7439. Ferranti, Ltd.—Reflectors for electric fires. 18th March, 1953. (726104.)

7520. General Electric Co.—Electrical step-by-step switches. 18th March, 1953. (725974.)

7763. Akt.-Ges. für Technische Studien.—Thermal power installations. 20th March, 1953. (725978.)

7913. General Electric Co.—High frequency communication systems. 23rd March, 1953. (726240.)

8297. Small Electric Motors, Ltd.—Balancing machines. 25th March, 1953. (726107.)

8900. Philips Electrical Industries, Ltd.—Acoustic resistors. 31st March, 1953. (726247.)

9526. Firestone Tire & Rubber Co.—Heating of dielectric articles of different thickness by means of a high frequency field. 8th April, 1953. (725997.)

10050. Hyman, H.—Dry cells. 13th April, 1953. (726113.)

10545. Welch, L.—Electric spray guns. 13th July, 1953. (726455.)

11034. Reyrolle & Co., Ltd., A., and Moser-Glaser & Co. Akt.-Ges.—High voltage electric transformers. 22nd April, 1953. (726003.)

11218. General Electric Co.—Rotors for dynamo-electric machines. 23rd April, 1953. (726117.)

12020. T.O.B.I. N.V.—Flow meter circuits including a.c. induction flow meters. 30th April, 1953. (726013.)

12218. Mohr, K.—Electric cable connections. 2nd May, 1953. (726459.)

12723. Hoover, Ltd.—Food mixers. 7th May, 1953. (726460.)

12782. Akt.-Ges. Brown, Boveri & Cie.—Rotor winding for turbo-alternators. 7th May, 1953. (726261.)

12916. Standard Telephones & Cables, Ltd.—Circuit component selecting unit for television and like apparatus. 8th May, 1953. (726125.)

12934. Soc. d'Electronique et d'Automatisme.—Electric pulse reshaping circuits. 8th May, 1953. (726262.)

13518. Alden, M.—Electrical soldering terminal. 14th May, 1953. (726467.)

13889. General Electric Co.—Dynamo-electrical machines. 18th May, 1953. (726469.)

14067. Aktiebolaget Bostadsforskning.—High frequency heating systems. 19th May, 1953. (726359.)

15422. General Electric Co.—Saturable core convertors. 4th June, 1953. (726476.)

15567. Standard Telephones & Cables, Ltd.—Gamma correcting frequency compensating circuit. 5th June, 1953. (726134.)

15813. Mallory Batteries, Ltd.—Alkaline electric dry cell. 9th June, 1953. (726365.)

16286/7. Hoover, Ltd.—Electric irons. 12th June, 1953. (726024/5.)

16783. Cinch Manufacturing Corporation.—Holders for thermionic valves, electrical plugs or other electrical devices having projecting terminal prongs. 17th June, 1953. (726029.)

16861. Hazeltine Corporation.—Colour television receiver signal modifying system. 18th June, 1953. (726030.)

16968. Westinghouse Electric International Co.—Control systems for electric motors. 19th June, 1953. (726274.)

17023. General Electric Co.—Arc welding apparatus. 19th June, 1953. (726372.)

17362. Philips Electrical Industries, Ltd.—Manufacture of porous sintered metal elements. 23rd January, 1953. (726032.)

17644. Philips Electrical Industries, Ltd.—Magnetic separators. 25th June, 1953. (726376.)

18585. Soc. Francaise Radio-Electrique.—Balanced modulator circuit arrangements. 3rd July, 1953. (726281.)

18727. Collins, J. E.—Solenoid-operated valve. 6th July, 1953. (726379.)

18798. Warner Electric Brake & Clutch Co.—Electromagnetic clutches. 7th July, 1953. (726487.)

19040. Allmanna Svenska Elektriska Aktiebolaget.—Operation of the cell switch of a storage battery. 9th July, 1953. (726283.)

20041. Standard Telephones & Cables, Ltd.—Electric pulse generators employing semiconductors. 20th July, 1953. (726496.)

20776. British Thomson-Houston Co., Ltd.—Electric arc furnace control systems. 27th July, 1953. (726498.)

21342. Ismay Lamps, Ltd., and Deshaw, H.—Gettering of incandescent electric vacuum lamp filaments. 31st July, 1953. (726502.)

21445. Electric Storage Battery Co.—Electric batteries. 4th August, 1953. (726391.)

21532. General Electric Co.—Radio directional apparatus. 4th August, 1953. (726392.)

21628. General Electric Co.—Refrigerator apparatus. 5th August, 1953. (726041.)

22135. Siemens & Halske Akt.-Ges.—Circuit arrangements for stopping selectors which are driven by a plurality of alternately operating magnets. 11th August, 1953. Addition to 716452. (726393.)

22238. Olympia Werke West Ges.—Control system for electric motors. 12th August, 1953. (726394.)

22318. Wilson & Co., Ltd., H.—Electric heating elements. 13th August, 1953. (726504.)

22508. Sangamo Weston, Ltd.—Speed responsive systems particularly electrical tachometers. 14th August, 1953. (726296.)

22899. Communications Patents, Ltd.—Controlling the speed of motors. 19th August, 1953. (726397.)

22910. Bendix Aviation Corporation.—Frequency regulating systems for dynamo-electric invertors. 19th August, 1953. (726297.)

23537. Greengate & Irwell Rubber Co., Ltd.—Electric insulated cables. 19th July, 1954. (726509.)

25189. Philips Electrical Industries, Ltd.—Methods of treating germanium for use in electrical devices. 11th September, 1953. (726403.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—18th March. Brisbane City Council Department of Electricity. Copper equivalent, aluminium alloy or steel cored aluminium conductor. (E.S.B. 1969/55. Ten/12391.)*

Ballycarry.—20th February. Heating installations in Presbyterian church. D. Calwell, Bellahill House, Carrickfergus, Co. Antrim.

Belfast.—25th February. City Council. Rubber insulated cables and flexible cords for twelve months; and blow-down pipe-work. 7th April. Switchgear and accessories and extensions to existing coal handling plant for Power Station West. (See this issue.)

25th February. Government of Northern Ireland. Electrical installation in forensic and industrial science laboratories, Verner Street. Ministry of Commerce, Room 103, Law Courts Building, May Street.

Belgian Congo.—25th March. Ministry of Colonies, Brussels. A central air conditioning plant. (E.S.B. 1507/55. Ten/12402.)*

Blackpool.—28th February. County Council. Street lighting equipment. (See this issue.)

Coldstream.—19th February. Borough Council. Wiring for 32 houses. Town Clerk.

Down.—17th February. County Health Committee. Electrical installations in health clinic and offices at Newry and Downpatrick. J. M'Candless, consulting engineer, 6, Murray Street, Belfast.

24th February. County Education Committee. Electrical installations in new primary school, Scarva. J. V. T. Scott, 30, College Gardens, Belfast.

East Riding.—23rd February. County Council. Supply of electric lamps for one year. Supplies officer, County Hall, Beverley.

Edinburgh.—North of Scotland Hydro-Electric Board. 33 kV switchgear for Kintore substation, Aberdeenshire. (See this issue.)

Egypt.—9th March. Ministry of Public Works, Mechanical and Electrical Department, Cairo. Seven transformer substations with switchgear and building works. (E.S.B. 2007/55. Ten/12427.)* 10th March. Two pumpless mercury arc rectifier substations with switchgear for Cairo University. (E.S.B. 1931/55. Ten/12428.)* 16th March. Centrifugal pumping units and one single-circuit transmission line. (E.S.B. 2008/55. Ten/12437.)*

15th March. Factories Directorate, Ministry of War. Exhaust fans. (E.S.B. 1825/55. Ten/12384.)* 26th March. Interior and exterior lighting fittings. (E.S.B. 1824/55. Ten/12378.)*

Fareham.—25th February. U.D.C. Street lighting equipment. (See this issue.)

Friern Barnet.—28th February. U.D.C. Street lighting lamps. (See this issue.)

Harrogate.—28th February. Borough Council. Supply of electric lamps for one year. Borough engineer.

India.—15th March. Director General of Supplies, New Delhi. Fuse cut-outs, automatic reclosers, shunt capacitors, oil circuit breakers and isolating switches. (E.S.B. 1615/55. Ten/12386.)*

Iraq.—12th March. Directorate General of Municipalities, Bagdad. Electrically operated pumping units and water treatment plant. (E.S.B. 2053/55. Ten/12430.)* 15th March. One 1,000 kW alternator for Hilla power station. (E.S.B. 2054/55. Ten/12417.)* One 1,000 kVA and six 100 kVA transformers and one l.v. switchboard for Halla Water and Electricity Board. (E.S.B. 2055/55. Ten/12419.)*

Irlam.—26th February. Urban Council. Supply of electric lamps for one year. Council surveyor.

Kincardine.—2nd March. Fife County Council. Street lighting equipment. (See this issue.)

Kuwait.—4th April. Government Electricity Department. 11 kV metalclad switchgear. (See this issue.)

Luton.—23rd February. Town Council. Electrical installations in canteens in Beech Hill, Tennyson Road and Maidenhall Schools. Borough surveyor.

New Zealand.—15th March. Stores Division, Post and Telegraph Department, Wellington. Radio valves. (E.S.B. 1999/55. Ten/12403.)*

Norwich.—23rd February. City Council. Street lighting equipment. (See this issue.)

Prudhoe (Northumberland).—19th February. U.D.C. Installation of electricity in 28 council houses at Castle Dene. Engineer, Council Offices.

South Africa.—24th February. Union Tender and Supplies Board. Electric deck scrubbers and driers for the South African Navy. (E.S.B. 2222/55. Ten/12445.)*

3rd March. Stores Department, South African Railways. Switchgear and transformers. (E.S.B. 2042/55. Ten/12429.)*

United States.—15th February. The Commission of Public Utility, Washington. One 2,500 kVA transformer. (E.S.B. 1887/55. Ten/12438.)*

18th February. Bonneville Power Administration, Oregon. Three-phase power transformers. (E.S.B. 2162/55. Ten/12468.)*

1st March. Department of the Interior, Bureau of Reclamation. One 1,500 kVA unit substation for Fargo Substation, North Dakota, Missouri River Basin Project. (E.S.B. 1874/55. Ten/12421.)*

3rd March. U.S. Bureau of Reclamation. One 10,000 kVA transformer for Yankton substation. (E.S.B. 1873/55. Ten/12412.)*

Widnes.—1st March. Borough Council. Supply of electrical materials for one year. Borough surveyor.

ORDERS PLACED

Glasgow.—Municipal Transport Committee. 500 kW rectifier and auxiliaries for Pinkston power station (£6,073).—Hackbridge & Hewittic Electric Co.

Education Committee. Electrical installation, Woodcroft Avenue, Broomhill, Primary School (£1,438).—Claud Hamilton.

Mansfield.—Corporation. Street lighting equipment (£4,860).—B.T.H. Co.

Wrexham.—Corporation. Lamp standards and fittings for improving the lighting in non-trunk roads (£4,885).—G.E.C.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashton-under-Lyne.—New bacon curing factory and slaughter house, Conduit Street; Brazier & Hartington, architects, 21, Market Street, Altrincham.

Aston-on-Trent (Nottingham).—Enlargement of Aston Hall Mental Hospital (£870,000), for Sheffield Regional Hospital Board; architect, Fulwood House, Old Fulwood Road, Sheffield, 10.

Bangor.—Technical college; director of education, County Education Offices, Caernarvon.

Birmingham.—Extensions to works at Camden Street for Bulpitt & Sons, Ltd.; T. Elvins & Sons, Ltd., Soho Hill.

Pump house, Minworth; Tame & Red District Drainage Board, Rookery Park.

Bradford.—Replacement of block (£80,000), and twin theatre unit (£30,000), St. Luke's Hospital; secretary, Leeds Regional Hospital Board, Park Parade, Harrogate.

Caernarvon.—Factory, Balaclava Road, for Thomas & Evans, Ltd.; Williams & Williams, Ltd.

Cambridge.—Shire Hall Courts (£300,000); Sir Wm. Holford & Partners, architects, 5, Cambridge Terrace, London, N.W.1.

Carlisle.—Factory, Botcherby (£700,000); Metal Box Co., Ltd., The Langham, Portland Place, London, W.1.

Cheadle & Gatley.—Houses (187), for U.D.C.; Vessey, Ltd., Marple, Cheshire.

Chelmsford.—Houses (1,083), Moulsham estate; H. F. Mulligan, surveyor, 80, Rosslyn Avenue, Harold Wood, Romford.

Doncaster.—Health clinic and offices, Chequer Road and secondary modern school, Intake estate; city architect.

Haverfordwest.—Combined county health offices, ambulance headquarters and central clinic at Horse Fair, for Pembrokeshire County Council; county architect.

Huddersfield.—New general hospital; secretary, Leeds Regional Hospital Board, Park Parade, Harrogate.

Ipswich.—Further section of scheme for Civic College (£332,000); borough surveyor, 19, Tower Street.

Leigh (Lancs).—Civic centre and public library; J. Prestwich & Sons, architects, Bradshawgate Chambers.

Liverpool.—Five-storey hotel at Brunswick Street; Threlfall's Brewery Co., Ltd. Trueman Street.

London.—Large extensions to St. Bartholomew's Hospital; Adams, Holden & Pearson, architects, 38, Gordon Square, W.C.1.

Manchester.—Erection of Irwell College, Hardman Street and Water Street; city surveyor, Town Hall, 2.

Central grammar school, Levenshulme; G. & J. Seddon, Ltd., Little Hulton, near Bolton.

Newcastle-on-Tyne.—Nine blocks of three-storey flats, Kenton North estate; city architect, 18, Cloth Market.

Northampton.—Ten-storey block of flats and maisonnettes, central area; borough architect.

Shrewsbury.—Cattle market (£129,020), Harlescott; G. Percy Trentham, Ltd., Park Hall Depot, Adderley Green, Longton, Stoke-on-Trent.

Sunderland.—Castle View County Junior School (£96,000); W. D. and R. Allison and Sons, builders, Whitburn.

Sutton Coldfield.—Factory and offices, Reddicap Hill, for Alexandra Controls, Ltd.; J. E. Hancox, architect, Royal House, South Parade.

Taplow.—Additional laboratories; British Telecommunications Research, Ltd., Taplow Court.

Truro.—Hospital, Treliske; South Western Regional Hospital Board, Parklands, Tyndalls Park, Bristol.

Tynemouth.—Canteen, stores, garage, etc., for Baltic Sawmills, Dock Road; Haswell and Son, architects, 77, Tyne Street, North Shields.

West Bromwich.—Factory, Black Lake; M. Firkin, Ltd., Carters Green.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).